

(51) International Patent Classification:
G06F 19/10 (2011.01)(21) International Application Number:
PCT/US2011/029947(22) International Filing Date:
25 March 2011 (25.03.2011)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
61/349,012 27 May 2010 (27.05.2010) US(71) Applicant (for all designated States except US): **EMERALD THERAPEUTICS, INC.** [US/US]; 3475-m Edison Way, Menlo Park, CA 94025 (US).

(72) Inventor; and

(75) Inventor/Applicant (for US only): **KLEINBAUM, Daniel, J.** [US/US]; 243 Emerald Drive, Yardley, PA 19067 (US).(74) Agents: **BENT, Stephen, A.** et al.; Foley & Lardner LLP, 3000 K Street, NW, 6th Floor, Washington, DC 20007-5143 (US).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM,

AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

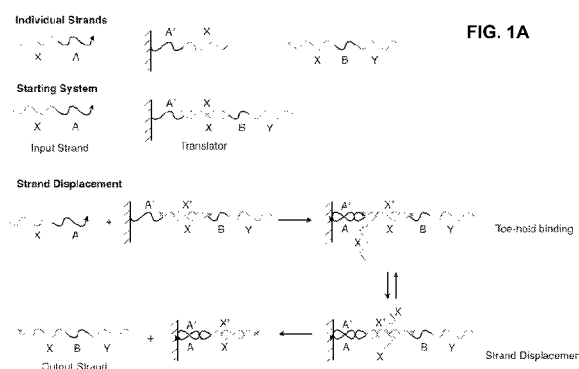
Published:

— with international search report (Art. 21(3))

— before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

(88) Date of publication of the international search report:
19 January 2012

(54) Title: SYSTEM AND METHOD FOR PROPAGATING INFORMATION USING MODIFIED NUCLEIC ACIDS



(57) **Abstract:** A method for improving a nucleic acid-based molecular computing system includes (A) identifying a computing system comprised of (i) a nucleic acid structure that includes an incompletely base-paired duplex domain, (ii) at least one polynucleotide displacement molecule that can bind with the nucleic acid structure under hybridizing conditions, such that the nucleic acid structure undergoes a transition in energy state due to a branch migration reaction involving the duplex domain, and (iii) a clashing polynucleotide molecule that competes with the polynucleotide displacement molecule for binding the nucleic acid structure under the hybridizing conditions but that cannot produce a branch migration reaction involving the duplex domain; then (B) reconfiguring at least one of the displacement molecule and the nucleic acid structure, respectively, to incorporate a chemical modification relative to a first reference molecule that comprises natural nucleosides and has the same sequence content as the displacement molecule or the nucleic acid structure, as the case may be, wherein the modification causes binding of the displacement molecule and the nucleic acid structure to have a hybridization free energy, differing from that of a first reference binding between the displacement molecule or the nucleic acid structure and the first reference molecule, such that the branch migration reaction is facilitated relative to the first reference binding; and/or (C) reconfiguring at least one of the clashing molecule and the nucleic acid structure, respectively, to incorporate a chemical modification relative to a second reference molecule that comprises natural nucleosides and has the same sequence content as the clashing molecule or the nucleic acid structure, as the case may be. The modification effected via such reconfiguring causes binding of the clashing molecule and the nucleic acid structure to have a hybridization free energy, differing from that of a second reference binding between the clashing molecule or the nucleic acid structure and the second reference molecule, such that binding of the clashing molecule is impeded relative to the second reference binding.