50 100 150 200 250 300 350 400 450 500

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | MTRNR2L2 | 3.98857884 | 51 | CDK1 | 5.58101418 | 101 | BORA | 3.08038112 | 151 | RAD54L | 2.44712085 | 202 | TCN2 | -2.7907527 | 251 | CYB5RL | 1.396894 | 301 | SAMD3 | -6.2089064 | 351 | SHMT1 | 0.74563943 | 401 | KIAA0895L | 1.96055493 | 451 | DUS1L | -1.1645026 |
| 2 | HIST1H2BM | -1.8466664 | 52 | HIST1H2BJ | 7.01533889 | 102 | MPND | -2.5515406 | 152 | CENPU | -2.0927428 | 203 | C16orf59 | -2.2860346 | 252 | HIRIP3 | -1.7994328 | 302 | METTL7B | -5.5746088 | 352 | DDIT3 | 2.65351607 | 402 | SLC43A3 | -13.262424 | 452 | POLD3 | 1.39986533 |
| 3 | HIST1H2BL | -1.4149007 | 53 | HIST1H3H | -1.0516319 | 103 | NUDT1 | -0.7649038 | 153 | H2AFX | -1.2012764 | 204 | OGDHL | 0.23340373 | 253 | WDR34 | -3.1057956 | 303 | BRCA1 | -1.560845 | 353 | CISH | -5.5528745 | 403 | TOMM40 | -2.0684328 | 453 | B9D1 | -1.0554557 |
| 4 | E2F1 | -0.8318639 | 54 | PBK | 2.30758125 | 104 | CDCA2 | 4.19752549 | 154 | HSD17B8 | -1.7613578 | 205 | RPA3 | -0.3629347 | 254 | PTP4A3 | -8.8483455 | 304 | KIF14 | 7.43754607 | 354 | FZD2 | -3.9592731 | 404 | ECH1 | 1.66347096 | 454 | CHEK1 | -0.1069904 |
| 5 | CDC45 | -0.6689946 | 55 | DSCC1 | 0.45617826 | 105 | HIST2H3D | -5.1496131 | 155 | SPC25 | 0.7699911 | 206 | HIST1H4D | 0.04320391 | 255 | NFE2 | 23.397792 | 305 | AIFM1 | -0.7002999 | 355 | WBSCR27 | -2.4031796 | 405 | DDX11 | 2.51600562 | 455 | SNRPA | 0.41021061 |
| 6 | MTRNR2L8 | 2.68931837 | 56 | HAUS7 | -2.9176362 | 106 | TELO2 | -2.8706067 | 156 | COMTD1 | -5.4906903 | 207 | CLSPN | 0.23956537 | 256 | RAB4B | -0.5247585 | 306 | TTF2 | 2.66662067 | 356 | CENPK | 1.07736913 | 406 | RPUSD4 | 0.71279628 | 456 | GPS1 | -1.8976971 |
| 7 | PIF1 | 1.55965326 | 57 | RMI2 | -2.7604839 | 107 | TONSL | -0.4411546 | 157 | C21orf58 | -0.9166011 | 208 | TPX2 | 3.19796614 | 257 | ILVBL | 0.52515091 | 307 | ARHGAP4 | -8.9386036 | 357 | BCAN | -1.4029818 | 407 | SHROOM1 | -0.666875 | 457 | TRAF2 | -0.2672987 |
| 8 | CDCA5 | 2.20092216 | 58 | MYBL2 | -0.0856958 | 108 | HIST1H2AB | -2.1416385 | 158 | HIST1H2AM | -1.0447329 | 209 | HIST1H4E | 1.80711104 | 258 | DTYMK | -0.3507309 | 308 | SLC2A4RG | -2.1026488 | 358 | MOXD1 | -34.32363 | 408 | CENPQ | -0.0143057 | 458 | SCARNA3 | 5.05023314 |
| 9 | FAM64A | 2.35839661 | 59 | CDC20 | 3.2791947 | 109 | PRC1 | 4.48905446 | 159 | METRN | -1.3671445 | 210 | FAM151A | -0.4365121 | 259 | HIST2H2AB | -2.8790738 | 309 | GCSH | -0.2148706 | 359 | POLD1 | 1.02728679 | 409 | KIAA1524 | 1.36557651 | 459 | PRIM2 | -0.4952942 |
| 10 | SPC24 | 1.60588493 | 60 | NDC80 | 1.72471097 | 110 | TYMS | 0.67471162 | 160 | SGOL1 | 3.40689716 | 211 | OIP5 | -0.3836145 | 260 | PFAS | -1.3578701 | 310 | ZNF784 | -3.244667 | 360 | THOP1 | -0.8572353 | 410 | LRP3 | -11.934896 | 460 | TUBA3FP | -0.1295957 |
| 11 | HIST1H2AJ | -1.6134132 | 61 | UHRF1 | -0.2666142 | 111 | HIST1H3A | -2.5174413 | 161 | TROAP | 3.36887137 | 212 | TSTA3 | -3.118101 | 261 | RACGAP1 | 3.73478881 | 311 | KHK | 0.50652131 | 361 | SFXN2 | -3.4412251 | 411 | COMMD4 | -4.4776308 | 461 | ATG16L2 | 0.72517101 |
| 12 | PSRC1 | 3.57573386 | 62 | DLGAP5 | 3.87608579 | 112 | AURKA | 3.80425893 | 162 | SHISA8 | -0.3955242 | 213 | HIST1H2BN | 8.66054089 | 262 | PLK4 | 1.793983 | 312 | MYT1 | 9.64783588 | 362 | ZNF695 | 5.78239934 | 412 | KRTCAP3 | 0.95287349 | 462 | KCNJ12 | -5.7754094 |
| 13 | ENHO | -12.646465 | 63 | E2F8 | 1.162911 | 113 | EXO1 | 1.49076431 | 163 | CENPW | 0.76209611 | 214 | ENGASE | 1.50267644 | 263 | MXD3 | -0.7347239 | 313 | RIBC2 | -5.6810223 | 363 | HAGHL | 0.4694897 | 413 | ANKLE1 | -0.8685689 | 463 | LRRCC1 | -1.9012137 |
| 14 | CENPM | -1.5220926 | 64 | GTSE1 | 2.05665262 | 114 | DTL | 1.16707498 | 164 | CDCA7 | 0.42970503 | 215 | RFC5 | 0.81179387 | 264 | IDH2 | 1.26932798 | 314 | LINC01315 | 0.61452594 | 364 | ANLN | 13.4116711 | 414 | TMEFF1 | 0.14058954 | 464 | DHODH | -0.3556216 |
| 15 | PLCG2 | -4.5810628 | 65 | MTFR2 | 1.22954398 | 115 | NCAPH | 1.57556916 | 165 | TOP2A | 5.39056421 | 216 | DDIAS | 1.29992879 | 265 | PYCRL | -6.5954922 | 315 | MRPS34 | -1.0994894 | 365 | MARC1 | -5.9923683 | 415 | D2HGDH | -0.1917461 | 465 | RASGRP2 | -22.188236 |
| 16 | RNU12 | -6.745985 | 66 | MCM5 | -1.565965 | 116 | CCNB1 | 2.43334783 | 166 | NUSAP1 | 3.79163299 | 217 | MSTO1 | 0.78086488 | 266 | FAM111B | -2.2590904 | 316 | CBX3P2 | -1.9280719 | 366 | JPH1 | 0.8278574 | 416 | DPF1 | 1.07275299 | 466 | HIST1H2BC | 0.3197465 |
| 17 | ORC6 | 1.80316237 | 67 | CCNF | 2.7680239 | 117 | DDX12P | 3.13574224 | 167 | IQGAP3 | 4.55686469 | 218 | HIST1H4J | -2.0637799 | 267 | SLC19A1 | -1.4490319 | 317 | EDA | -8.7095757 | 367 | SGK3 | -5.1577639 | 417 | MND1 | 0.50401353 | 467 | CENPE | 2.6171425 |
| 18 | KIFC1 | 3.23192139 | 68 | LRRC45 | -2.6577503 | 118 | KIF22 | 0.73310569 | 168 | UBE2T | 2.57367056 | 219 | PKN3 | -1.7595929 | 268 | LOC1002886 | 2.89675153 | 318 | SLC25A11 | -1.4285337 | 368 | TSPAN17 | -1.6336532 | 418 | DPYSL5 | 1.11867855 | 468 | NCL | 0.17457566 |
| 19 | KIF18B | 3.14783215 | 69 | HIST1H3B | -1.2729755 | 119 | HIST1H2AH | -6.3749949 | 169 | ORC1 | 1.20023608 | 220 | NPW | -7.2463895 | 269 | PGP | -0.6734492 | 319 | DNPH1 | -2.1942864 | 369 | XRCC3 | -0.5000238 | 419 | SDHAP1 | 3.21681272 | 469 | ATF6B | -1.3281099 |
| 20 | RDM1 | 0.55462595 | 70 | CCNA2 | 2.69961172 | 120 | ATP2A1-AS1 | -3.1909302 | 170 | NCAPD3 | 3.40980204 | 221 | FAM83D | 4.44516152 | 270 | OXCT1 | -9.8493196 | 320 | DSN1 | -0.706977 | 370 | APOBEC3C | -10.239564 | 420 | PSKH1 | -3.6843862 | 470 | MEIG1 | -1.1346902 |
| 21 | HIST1H3J | -0.9576329 | 71 | KISS1R | 0.89985949 | 121 | GPAT2 | -5.8347405 | 171 | C2orf48 | 4.78939298 | 222 | FOXM1 | 0.35804518 | 271 | CASC5 | 8.90958267 | 321 | LSM7 | -1.7290707 | 371 | ENOSF1 | -1.3231032 | 421 | RFC4 | 1.10744557 | 471 | RAD51D | -2.9321473 |
| 22 | CDCA8 | 3.65927249 | 72 | BUB1B | 4.36416722 | 122 | HIST1H2AG | 0.59151696 | 172 | FOXRED1 | -0.955578 | 223 | KNSTRN | 2.09163854 | 272 | MFSD3 | -1.1290048 | 322 | POLR2E | -0.1699028 | 372 | INTS1 | 0.8166957 | 422 | PNPO | -0.1800098 | 472 | C5orf34 | 0.96661448 |
| 23 | CDCA3 | 1.75703637 | 73 | NUF2 | 2.63819706 | 123 | UBE2C | 2.53415686 | 173 | LOC642846 | 3.15087639 | 224 | DCTPP1 | -1.5047062 | 273 | TFAP4 | -4.1548634 | 323 | MNX1-AS1 | -3.6059737 | 373 | MEX3B | 0.18358469 | 423 | PTGES2 | -1.2055456 | 473 | GINS3 | -2.7837611 |
| 24 | RAD51AP1 | 2.72904298 | 74 | INCENP | 3.99742414 | 124 | ESPL1 | 2.90573896 | 174 | DHFR | -1.8180776 | 225 | LIG1 | -0.4058629 | 274 | RCCD1 | 0.88346763 | 324 | CCDC34 | -1.9497659 | 374 | CCHCR1 | -1.3222168 | 424 | NTHL1 | -1.6552111 | 474 | ARHGAP11B | 11.1698001 |
| 25 | AURKB | 2.53025828 | 75 | TNFAIP8L1 | 0.95204972 | 125 | FANCI | 2.12366332 | 175 | GAMT | -2.5487812 | 226 | BOP1 | -2.2664276 | 275 | TRABD2A | -0.0929748 | 325 | SNRNP25 | -2.303462 | 375 | TP73 | 0.11523922 | 425 | CENPV | 0.79528362 | 475 | ACY1 | -0.23395 |
| 26 | HIST1H2AI | 2.14960952 | 76 | MCM10 | 1.46901998 | 126 | RFC2 | -1.4926904 | 176 | WDR62 | 2.34855221 | 227 | FEN1 | -1.1791181 | 276 | SHPK | 1.35095554 | 326 | UBE2M | -0.0461848 | 376 | PRELID1 | -0.8154848 | 426 | CEP131 | -0.1460235 | 476 | ELFN1 | -4.4920093 |
| 27 | TK1 | -0.4536053 | 77 | KIAA0101 | 1.05791405 | 127 | NMU | 13.9119227 | 177 | RNASEH2A | -0.5491456 | 228 | DDX11-AS1 | 0.5387541 | 277 | POLE2 | -2.9120668 | 327 | CDPF1 | -0.974936 | 377 | GCDH | -1.1820043 | 427 | NOP16 | -1.3624107 | 477 | SNRPF | -0.7061715 |
| 28 | SHCBP1 | 2.30797578 | 78 | FANCG | 0.41250391 | 128 | CDC25A | 0.75163045 | 178 | E2F7 | 2.47394885 | 229 | RHOU | 1.58385755 | 278 | GMNN | -0.4692258 | 328 | HELLS | 0.77295719 | 378 | NUDT8 | -1.6548328 | 428 | NAPRT | -2.2504003 | 478 | SEC24B-AS1 | -0.9761977 |
| 29 | HJURP | 6.70501243 | 79 | KIF4A | 2.06841915 | 129 | FANCD2 | 1.55811933 | 179 | GSG2 | 0.19915226 | 230 | MTBP | 1.21306028 | 279 | APLP1 | -0.8955658 | 329 | DHRS2 | -3.289919 | 379 | ZBED3 | 0.68794204 | 429 | TYRO3 | 3.03425606 | 479 | ANXA6 | -2.7319484 |
| 30 | HIST1H2BO | -0.0497887 | 80 | CD33 | -29.194797 | 130 | WDR76 | 0.13320954 | 180 | SPAG5 | 3.86178178 | 231 | GLTPD2 | -2.3601134 | 280 | RMND5B | -1.3911569 | 330 | PEX11G | -7.2885292 | 380 | ATAD3A | -1.7860967 | 430 | MKI67 | 3.94810058 | 480 | NLE1 | -1.2371001 |
| 31 | RRM2 | 2.35010858 | 81 | MCM7 | 0.00046237 | 131 | SLC25A10 | -1.6399213 | 181 | HIATL2 | 0.69947314 | 232 | WDHD1 | 1.30418469 | 281 | ATAD2 | 2.84798016 | 331 | KREMEN2 | 3.89590215 | 381 | FDXR | -1.7914461 | 431 | SUV39H1 | 0.75697912 | 481 | FBF1 | -2.7617365 |
| 32 | ESCO2 | -0.4456622 | 82 | CDC25C | 2.43418762 | 132 | NEK2 | 6.53953076 | 182 | HMGB2 | 1.64114296 | 233 | FAM132B | -0.9906822 | 282 | PAPLN | -7.7061375 | 332 | TMEM63C | 2.15806056 | 382 | KCNQ2 | 0.50804733 | 432 | LIPE | 0.41723651 | 482 | C2orf81 | -1.3272818 |
| 33 | GINS2 | -0.8090575 | 83 | GINS4 | -0.3816984 | 133 | FANCA | 0.75478625 | 183 | CCNE2 | -0.6729223 | 234 | ZNF724P | 8.78051005 | 283 | FABP6 | -4.6873459 | 333 | MEF2BNB | -4.0905665 | 383 | PEX26 | 0.57828672 | 433 | ASRGL1 | -16.380323 | 483 | IMPA2 | -1.1111922 |
| 34 | E2F2 | -0.1291701 | 84 | MCM2 | 0.21285061 | 134 | H19 | -86.494189 | 184 | PFKL | 0.02837708 | 235 | CCDC78 | 0.12723533 | 284 | PSMC3IP | -1.1772693 | 334 | FBXO5 | 2.924299 | 384 | GABRD | -10.079275 | 434 | ADGRB2 | 2.63782723 | 484 | NEIL3 | 1.82711169 |
| 35 | BUB1 | 5.24816979 | 85 | KIF15 | 1.39593974 | 135 | CENPA | 2.28068118 | 185 | POLA2 | -0.698076 | 236 | RGS9BP | 1.06968655 | 285 | ATP6V1B1-A | -0.2833338 | 335 | FBXO48 | -1.7460949 | 385 | SPTBN2 | 0.71148202 | 435 | UNC45A | 0.7591637 | 485 | C19orf60 | -5.0107454 |
| 36 | HIST1H4A | -1.3060464 | 86 | RECQL4 | 0.18949291 | 136 | HIST1H3D | -0.4413747 | 186 | CCDC124 | -2.5684762 | 237 | CHAF1B | 0.47428492 | 286 | DHRS11 | -3.0752368 | 336 | DEPDC1 | 3.90239194 | 386 | MCM8 | 1.20287583 | 436 | HEXIM2 | 0.02143644 | 486 | RPUSD3 | -0.9603328 |
| 37 | KIF2C | 5.08278951 | 87 | MAD2L1 | 1.91796683 | 137 | HIST1H2AK | 0.59611518 | 187 | CHTF18 | -0.476921 | 238 | NOC4L | -2.798989 | 287 | GRIN1 | 2.58659973 | 337 | MED22 | -1.9575039 | 387 | C1QL1 | 1.92559844 | 437 | APITD1 | -2.1964269 | 487 | CEMIP | 15.7500079 |
| 38 | PKMYT1 | -0.5861777 | 88 | TMEM160 | -7.1375218 | 138 | TMEM107 | -0.9257271 | 188 | CKAP2L | 3.29232617 | 239 | KNTC1 | 1.96007564 | 288 | GMPPB | -1.5927953 | 338 | C9orf116 | -0.5854109 | 388 | CTXN1 | -3.6404992 | 438 | PRODH | 1.05212927 | 488 | KDELC2 | -1.2215512 |
| 39 | ASF1B | 0.4794183 | 89 | DEPDC1B | 3.00827389 | 139 | LMNB1 | 0.46031085 | 189 | SDF2L1 | -2.7846154 | 240 | HYLS1 | -0.6309515 | 289 | NCAPG2 | 2.16026516 | 339 | KIF23 | 4.11304981 | 389 | GALNT18 | -3.9383207 | 439 | ARHGAP19 | 4.21917188 | 489 | ARHGAP22 | -8.7000811 |
| 40 | HMMR | 2.42311974 | 90 | C16orf74 | 6.67252075 | 140 | PRC1-AS1 | 2.4525786 | 190 | TIMELESS | 0.39592146 | 241 | CCNB2 | -2.7299642 | 290 | ZNF775 | -0.217622 | 340 | LZTS1 | -14.613931 | 390 | RADIL | -0.6977595 | 440 | NLRX1 | -1.133094 | 490 | SSBP3 | -0.9957506 |
| 41 | EME1 | 4.35906247 | 91 | POLQ | 3.02714988 | 141 | CEP55 | 2.36837562 | 191 | MCM4 | -0.5742347 | 242 | C17orf53 | 1.08789683 | 291 | ARHGEF19 | 1.83492266 | 341 | STRA13 | -1.3153902 | 391 | TMEM141 | -0.8080607 | 441 | ZNF367 | 1.46811101 | 491 | ACCS | -2.3538251 |
| 42 | TMSB15A | -9.2644204 | 92 | CHAF1A | -0.5639719 | 142 | LRFN1 | -1.2188547 | 192 | GINS1 | 0.7061711 | 243 | ASPM | 2.54862213 | 292 | CDC7 | 0.97606254 | 342 | EMC9 | 0.23465746 | 392 | RANBP1 | -1.4683385 | 442 | CHN2 | -2.2117988 | 492 | LIN9 | 1.92909075 |
| 43 | NCAPG | 2.00640599 | 93 | HIST1H4H | -3.0403782 | 143 | TCF19 | -2.423919 | 193 | C9orf142 | -2.2782223 | 244 | CENPF | 3.87889868 | 293 | C4orf48 | -16.096517 | 343 | STARD8 | -11.345599 | 393 | MFI2-AS1 | 1.83736227 | 443 | NRM | -1.7199273 | 493 | PASK | 0.68843248 |
| 44 | KIF20A | 5.20424574 | 94 | PLK1 | 2.14799838 | 144 | TMEM238 | -5.9322219 | 194 | MELK | 1.34077258 | 245 | NCAPD2 | 3.03700699 | 294 | TMEM180 | -0.0680138 | 344 | CDC6 | 1.21344263 | 394 | FANCE | -0.5189889 | 444 | EMC6 | -2.0780144 | 494 | HIST1H4B | -13.619747 |
| 45 | TICRR | 7.58934263 | 95 | HIST1H2BF | 2.90391016 | 145 | DEPDC4 | 1.69033388 | 195 | MRM1 | -2.4175812 | 246 | LYPD6 | 1.17078502 | 295 | TAF5 | 1.36397866 | 345 | HIST1H2AD | 13.6044366 | 395 | C16orf95 | 0.23170452 | 445 | UNG | -0.0869622 | 495 | NUP210 | 0.13594479 |
| 46 | ZWINT | 1.28882637 | 96 | SKA1 | 1.05437154 | 146 | PRIM1 | -0.5554241 | 196 | CIT | 4.65650757 | 247 | BRIP1 | 0.49202569 | 296 | PHF19 | 0.5305954 | 346 | MCIDAS | 2.06205259 | 396 | CLN6 | -4.3967464 | 446 | CTSV | 1.00042876 | 496 | HAUS5 | 1.41087643 |
| 47 | BIRC5 | 1.22634528 | 97 | ERCC6L | 1.8335559 | 147 | CDKN3 | 1.99586682 | 197 | KIF11 | 2.50545778 | 248 | MCM3 | -0.8177072 | 297 | STMN1 | 0.38677342 | 347 | TRMT2A | -1.3184319 | 397 | POLE | 0.85478502 | 447 | LRRC20 | 1.10363845 | 497 | LINC00265 | 0.16281198 |
| 48 | TRAIP | -0.1063134 | 98 | ARHGAP11A | 6.47364654 | 148 | WNT10B | -0.5920107 | 198 | WDR18 | -2.9847082 | 249 | AMDHD2 | -10.304191 | 298 | MSH5 | 2.76564875 | 348 | SGOL2 | 5.24114161 | 398 | CISD3 | -2.4685352 | 448 | GPAA1 | -1.2313462 | 498 | PARP1 | 0.30896108 |
| 49 | RAD51 | 0.75793351 | 99 | TUBA1B | 0.27247679 | 149 | PTTG1 | 2.7078183 | 199 | RRM1 | 0.86443458 | 250 | MRPL38 | -1.8829863 | 299 | CDT1 | 0.12286241 | 349 | SORD | 0.89543485 | 399 | ZCCHC12 | 1.89033217 | 449 | FRS3 | -1.4828626 | 499 | FBXL6 | -1.0938013 |
| 50 | TTK | 4.68634153 | 100 | BLM | 0.50437513 | 150 | XRCC2 | -0.416688 | 200 | HIST1H4K | 2.41065709 | 251 | CYB5RL | 1.396894 | 300 | MXRA8 | -40.106226 | 350 | RFC3 | 1.11487264 | 400 | GRAMD2 | -18.659949 | 450 | KATNB1 | -1.1623699 | 500 | POC1A | 0.67830784 |

Supplementary Fig. S1 Magnified view of Fig. 8a