

## Suppl. Figure 1. List of the genomes used in this analysis.

### Eukaryotes

*Acanthamoeba castellanii*  
*Allomyces macrogynus*  
*Amborella trichopoda*  
*Amphimedon queenslandica*  
*Angomonas deanei*  
*Aplysia californica*  
*Aquilegia coerulea*  
*Arabidopsis thaliana*  
*Asterochloris* sp. Cgr/DA1phos  
*Aureococcus anophagefferens*  
*Babesia equi*  
*Bathycoccus prasinus*  
*Batrachochytrium dendrobatidis* JAM81  
*Bigelowiella natans*  
*Blastocystis hominis*  
*Bodo saltans*  
*Calliarthron tuberculosum*  
*Capsaspora owczarzaki*  
*Chlamydomonas reinhardtii*  
*Chlorella variabilis*  
*Chondrus crispus*  
*Cryptococcus neoformans*  
*Cyanidioschyzon merolae*  
*Cyanophora paradoxa*  
*Dictyostelium discoideum*  
*Drosophila melanogaster*  
*Emiliana huxleyi* CCMP1516  
*Entamoeba histolytica*  
*Fonticula alba*  
*Galdieria sulphuraria*  
*Giardia lamblia*  
*Gregarina niphandrodes*  
*Guillardia theta* CCMP2712  
*Hydra magnipapillata*  
*Ichthyophthirius multifiliis*  
*Klebsormidium flaccidum*  
*Leishmania major*  
*Micromonas pusilla* CCMP1545  
*Mnemiopsis leidyi*  
*Monosiga brevicollis*  
*Mus musculus*  
*Naegleria gruberi*  
*Oryza sativa*  
*Ostreococcus lucimarinus*  
*Oxytricha trifallax*  
*Paramecium tetraurelia*  
*Perkinsus marinus*  
*Phaeodactylum tricornerutum*  
*Physcomitrella patens*  
*Phytophthora parasitica*  
*Pinus taeda*  
*Plasmodium falciparum*  
*Polysphondylium pallidum*  
*Porphyridium purpureum*  
*Prunus persica*  
*Pyropia yezoensis*  
*Reticulomyxa filosa*  
*Rhizophagus irregularis* DAOM 181602  
*Saccharomyces cerevisiae*  
*Salpingoeca rosetta*  
*Schizochytrium aggregatum* ATCC 28209  
*Schizosaccharomyces pombe*  
*Selaginella moellendorffii*  
*Spiroplasma salmonicida*  
*Spizellomyces punctatus* DAOM BR117  
*Strongylocentrotus purpuratus*  
*Symbiodinium minutum*  
*Tetrahymena thermophila*  
*Thecamonas trahens* ATCC 50062  
*Theileria annulata*  
*Toxoplasma gondii*  
*Trichomonas vaginalis* G3  
*Trichoplax adhaerens*  
*Trypanosoma vivax*  
*Ustilago maydis*  
*Volvox carteri*

### Archaea

*Acidianus hospitalis* W1  
*Acidilobus saccharovorans* 345-15  
*Aeropyrum pernix* K1  
*Aigarchaeota archaeon* JGI 0000001-A7  
*Archaeoglobus fulgidus* DSM 4304  
*Caldisphaera lagunensis* DSM 15908  
*Caldivirga maquilingensis* IC-167  
*Candidatus Aenigmarchaeum subterraneum*

Candidatus <i>Caldiarchaeum subterraneum</i>	<i>Methanoculleus marisnigri</i> JR1
Candidatus <i>Haloredivivus</i> sp. G17	<i>Methanopyrus kandleri</i>
Candidatus <i>Iainarchaeum andersonii</i>	<i>Methanosaeta thermophila</i>
Candidatus <i>Korarchaeum cryptofilum</i> OPF8	<i>Methanosarcina mazei</i> Tuc01
Candidatus <i>Nanosalina</i> sp. J07AB43	<i>Methanospirillum hungatei</i>
Candidatus <i>Nitrososphaera gargensis</i> Ga9.2	<i>Methanotorris igneus</i>
Candidatus <i>Parvarchaeum acidiphilum</i> ARMAN-4_'5-way FS'	<i>Methanothermococcus thermolithotropicus</i> DSM 2095
Candidatus <i>Parvarchaeum acidophilus</i> ARMAN-5_'5-way FS'	<i>Methanothermus fervidus</i> DSM 2088
<i>Cenarchaeum symbiosum</i> A	<i>Nanoarchaeum equitans</i> Kin4-M
<i>Desulfurococcus kamchatkensis</i> 1221n	<i>Natronomonas pharaonis</i> DSM 2160
<i>Ferroglobus placidus</i> DSM 10642	<i>Nitrosopumilus maritimus</i> SCM1
<i>Ferroplasma acidarmanus</i> fer1	<i>Nitrososphaera viennensis</i>
<i>Fervidicoccus fontis</i> Kam940	<i>Pyrobaculum aerophilum</i> str. IM2
<i>Haladaptatus paucihalophilus</i>	<i>Pyrobaculum islandicum</i> DSM 4184
<i>Haloferax volcanii</i> DS2	<i>Pyrococcus abyssi</i> GE5
<i>Halogeometricum borinquense</i> DSM 11551	<i>Pyrolobus fumarii</i> 1A
<i>Hyperthermus butylicus</i> DSM 5456	<i>Staphylothermus hellenicus</i>
<i>Ignicoccus hospitalis</i> KIN4/I	<i>Staphylothermus marinus</i> F1
<i>Ignisphaera aggregans</i> DSM 17230	<i>Sulfolobus islandicus</i> HVE10/4
<i>Metallosphaera sedula</i> DSM 5348	<i>Sulfolobus solfataricus</i> P2
<i>Methanobacterium formicicum</i> DSM 3637	<i>Sulfolobus tokodaii</i>
<i>Methanobrevibacter arboriphilus</i> ANOR1	<i>Thermococcus kodakarensis</i> KOD1
<i>Methanobrevibacter smithii</i>	<i>Thermococcus litoralis</i>
<i>Methanocaldococcus fervens</i> AG86	<i>Thermofilum pendens</i> Hrk 5
<i>Methanocaldococcus jannaschii</i>	<i>Thermogladius cellulolyticus</i> 1633
<i>Methanocella paludicola</i> SANAE	<i>Thermoplasma volcanium</i> GSS1
<i>Methanococcoides burtonii</i>	<i>Thermoproteus tenax</i> Kra 1
<i>Methanococcus maripaludis</i> C5	<i>Thermosphaera aggregans</i> DSM 11486
	<i>Vulcanisaeta distributa</i> DSM 14429

### **Bacteria**

<i>Acaryochloris</i> sp. CCMEE 5410	<i>Alicyclobacillus acidocaldarius</i> DSM 446
<i>Acetobacter nitrogenifigens</i> DSM 23921	<i>Aminomonas paucivorans</i> DSM 12260
<i>Acholeplasma granularum</i> ATCC 19168	<i>Ammonifex degensii</i> KC4
<i>Acidimicrobium ferrooxidans</i> DSM 10331	<i>Anaerolinea thermophila</i> UNI-1
<i>Acidithiobacillus ferrooxidans</i> ATCC 23270	<i>Anaplasma phagocytophilum</i> str. Dog2
<i>Acidobacterium capsulatum</i> ATCC 51196	<i>Anoxybacillus kamchatkensis</i> G10
<i>Actinobaculum massiliae</i> ACS-171-V-Col2	<i>Aquifex aeolicus</i> VF5
<i>Actinoplanes friuliensis</i> DSM 7358	<i>Armatimonadetes bacterium</i>
<i>Actinoplanes missouriensis</i> 431	<i>Arthrobacter aurescens</i> TC1
<i>Actinopolyspora halophila</i> DSM 43834	<i>Arthrospira platensis</i> C1
<i>Aeromonas hydrophila</i> 116	<i>Aurantimonas coralicida</i> DSM 14790
<i>Agarivorans albus</i>	<i>Azoarcus</i> sp. BH72
<i>Akkermansia muciniphila</i> ATCC BAA-835	<i>Bacillus subtilis</i> B7-s
<i>Alcanivorax pacificus</i> W11-5	<i>Bacteroides fragilis</i> HMW 610
<i>Alcanivorax</i> sp. DG881	<i>Bdellovibrio bacteriovorus</i> HD100
<i>Algoriphagus marincola</i> HL-49	<i>Bifidobacterium bifidum</i> BGN4

*Blastopirellula marina* DSM 3645  
*Bordetella avium* 197N  
*Bordetella bronchiseptica* 7E71  
*Borrelia burgdorferi* 118a  
*Brachyspira innocens* ATCC 29796  
*Brevibacterium album* DSM 18261  
*Burkholderia cenocepacia*  
*Caldilinea aerophila* DSM 14535 = NBRC 104270  
*Caldisericum exile* AZM16c01  
*Calditerrivibrio nitroreducens* DSM 19672  
*Caldithrix abyssi* DSM 13497  
*Campylobacter gracilis*  
*Campylobacter jejuni* 10186  
*Candidatus Aerophobus profundus*  
*Candidatus Aminicenans sakinawicola* JGI OTU-1  
*Candidatus Caldatribacterium californiense*  
*Candidatus Calescibacterium nevadense* OTU 1  
*Candidatus Fervidibacter sacchari* JGI OTU-1  
*Candidatus Nitrospira defluvii*  
*Caulobacter crescentus* NA1000  
*Chlamydia pneumoniae* B21  
*Chlamydophila felis* Fe/C-56  
*Chlorobium limicola*  
*Chlorobium luteolum* DSM 273  
*Chlorobium tepidum* TLS  
*Chloroflexus aurantiacus* J-10-fl  
*Chlorogloeopsis fritschii* PCC 6912  
*Chloroherpeton thalassium* ATCC 35110  
*Chroococcidiopsis thermalis* PCC 7203  
*Chrysiogenes arsenatis* DSM 11915  
*Chthoniobacter flavus* Ellin428  
*Chthonomonas calidirosea* T49  
*Clostridium acetobutylicum* ATCC 824  
*Clostridium aerotolerans* DSM 5434  
*Clostridium saccharobutylicum*  
*Collinsella tanakaei*  
*Conexibacter woesei*  
*Coprobacillus* sp. 3\_3\_56FAA  
*Coprothermobacter proteolyticus* DSM 5265  
*Corynebacterium diphtheriae* 241  
*Cytophaga aurantiaca* DSM 3654  
*Cytophaga hutchinsonii* ATCC 33406  
*Dehalococcoides mccartyi* 195  
*Dehalogenimonas lykanthroporepellens* BL-DC-9  
*Deinococcus deserti* VCD115  
*Deinococcus radiodurans* R1  
*Desulfarculus baarsii* DSM 2075  
*Desulfatibacillum alkenivorans* AK-01  
*Desulfobacter curvatus* DSM 3379  
*Desulfovibrio alkalitolerans* DSM 16529  
*Desulfurispirillum indicum* S5  
*Desulfurobacterium thermolithotrophum*  
*Desulfovibrio acrylicus*  
*Dethiosulfovibrio peptidovorans* DSM 11002  
*Dichelobacter nodosus* VCS1703A  
*Dictyoglomus thermophilum* H-6-12  
*Elusimicrobium minutum* Pei191  
*Enterococcus faecalis* 62  
*Entomoplasma lucivorax* ATCC 49196  
*Escherichia coli* K2  
*Ferrovum myxofaciens*  
*Fervidobacterium nodosum* Rt17-B1  
*Fibrobacter succinogenes* S85  
*Fimbriimonas ginsengisoli* Gsoil 348  
*Fischerella muscicola* PCC 7414  
*Fischerella thermalis*  
*Flavobacterium antarcticum* DSM 19726  
*Frankia alni* ACN14a  
*Frankia* sp. BMG5.23  
*Fusobacterium nucleatum*  
*Fusobacterium periodonticum* ATCC 33693  
*Gallionella capsiferriformans* ES-2  
*Gemmata obscuriglobus* UQM 2246  
*Gemmatimonadetes bacterium* KBS708  
*Gemmatimonas aurantiaca* T-27  
*Geobacter sulfurreducens* PCA  
*Geovibrio* sp. L21-Ace-BES  
*Gloeobacter violaceus* PCC 7421  
*Gloeocapsa* sp. PCC 73106  
*Glycomyces arizonensis* DSM 44726  
*Halanaerobium praevalens* DSM 2228  
*Halobacteroides halobius* DSM 5150  
*Halothermothrix orenii*  
*Helicobacter pylori* 35A  
*Herpetosiphon aurantiacus* DSM 785  
*Hydrogenivirga* sp. 128-5-R1-1  
*Hydrogenobacter thermophilus* TK-6  
*Hydrogenobaculum* sp. SN  
*Hyphomonas* sp. 25B14\_1  
*Ignavibacterium album* JCM 16511  
*Ilumatobacter coccineus*  
*Ilyobacter polytropus*  
*Isosphaera pallida* ATCC 43644  
*Jiangella gansuensis* DSM 44835  
*Kandleria vitulina* DSM 20405  
*Kiloniella laminariae* DSM 19542  
*Kineococcus radiotolerans* ATCC BAA-149  
*Kitasatospora setae* KM-6054

*Kitasatospora* sp. NRRL B-11411  
*Kordiimonas gwangyangensis* JCM 12864  
*Kosmotoga olearia* TBF 19.5.1  
*Ktedonobacter racemifer* DSM 44963  
*Lactobacillus acidophilus* ATCC 4796  
*Legionella pneumophila* Leg01/16  
*Lentisphaera araneosa* HTCC2155  
*Leptospira* sp. B5-022  
*Leptospirillum* sp. Group I  
*Leptotrichia buccalis* C-1013-b  
*Leptotrichia wadei*  
*Lyngbya aestuarii* BL J  
Marinimicrobia bacterium JGI 0000039-D08  
*Marinithermus hydrothermalis* DSM 14884  
*Marinitoga piezophila* KA3  
*Mariprofundus ferrooxydans* PV-1  
*Meiothermus ruber* H328  
*Meiothermus silvanus* DSM 9946  
*Melioribacter roseus* P3M-2  
*Mesorhizobium australicum*  
*Mesotoga prima* MesG1.Ag.4.2  
*Methylobacillus glycogenes* JCM 2850  
*Methylophilus methylotrophus*  
*Microchaete* sp. PCC 7126  
*Mitsuokella multacida* DSM 20544  
*Mycoplasma alkalescens* 14918  
*Myxococcus xanthus* DK 1622  
*Natranaerobius thermophilus* JW/NM-WN-LF  
*Nautilia profundicola* AmH  
*Neisseria bacilliformis* ATCC BAA-1200  
*Neisseria gonorrhoeae* 1291  
*Neisseria meningitidis*  
*Neochlamydia* sp. S13  
*Nitratifractor salsuginis* DSM 16511  
*Nitratiruptor* sp. SB155-2  
*Nitrolancea hollandica* Lb  
*Nitrosococcus halophilus* Nc 4  
*Nitrosomonas eutropha* C91  
*Nitrospina gracilis* 3/211  
*Nocardia farcinica* IFM 10152  
*Nocardiopsis alkaliphila* YIM 80379  
*Nostoc punctiforme* PCC 73102  
*Oceanimonas* sp. GK1  
*Oceanithermus profundus* DSM 14977  
*Opitutus terrae* PB90-1  
*Parvularcula bermudensis* HTCC2503  
*Pasteurella multocida* 1500C  
*Pedobacter agri* PB92  
*Persephonella marina* EX-H1  
*Petrotoga mobilis* SJ95  
*Phycisphaera mikurensis* NBRC 102666  
*Pirellula staleyi* DSM 6068  
*Planctomyces limnophilus* DSM 3776  
*Planctomyces maris*  
*Pleurocapsa* sp. PCC 7327  
Poribacteria bacterium WGA-3G  
*Prevotella aurantiaca* JCM 15754  
*Propionibacterium acidipropionici* DSM 4900  
*Prosthecochloris aestuarii* DSM 271  
*Pseudomonas aeruginosa*  
*Pseudomonas alcaliphila* 34  
*Pseudonocardia autotrophica*  
*Psychrobacter arcticus* 273-4  
*Rhodopirellula baltica* SH 1  
*Rhodospirillum centenum* SW  
*Rickettsia felis* URRWXC12  
*Saccharopolyspora erythraea* NRRL 2338  
*Salinimonas chungwhensis* DSM 16280  
*Sebaldella termitidis*  
*Simkania negevensis* Z  
*Singulisphaera acidiphila* DSM 18658  
*Sorangium cellulosum* So0157-2  
*Sphingobium chlorophenolicum* L-1  
*Sphingobium indicum*  
*Sphingobium* sp. AP49  
*Spirochaeta* sp.  
*Spirochaeta thermophila* DSM 6192  
*Staphylococcus aureus* 1484-9  
*Streptococcus agalactiae* 515  
*Streptomyces aurantiacus*  
*Sulfurihydrogenibium subterraneum* DSM 15120  
*Sulfurimonas autotrophica* DSM 16294  
*Sulfurovum* sp. AR  
*Synechococcus elongatus* PCC 6301  
*Synechococcus* sp. JA-3-3Ab  
*Synergistes jonesii*  
*Synergistes* sp. 3\_1\_syn1  
*Terrimonas ferruginea* DSM 30193  
*Thermodesulfatator atlanticus* DSM 21156  
*Thermodesulfobacterium thermophilum* DSM 1276  
*Thermodesulfobacterium islandicus* DSM 12570  
*Thermomicrobium roseum* DSM 5159  
*Thermosipho africanus* TCF52B  
*Thermotoga maritima* MSB8  
*Thermotoga profunda*  
*Thermotoga* sp. A7A  
*Thermovibrio ammonificans* HB-1  
*Thermovirga lienii*

*Thermus aquaticus* Y51MC23  
*Thermus islandicus* DSM 21543  
*Thiobacillus thioparus* DSM 505  
*Treponema bryantii* NK4A124  
*Treponema denticola*

*Truepera radiovictrix* DSM 17093  
*Waddlia chondrophila* WSU 86-1044  
*Xanthomonas oryzae* ATCC 35933  
*Zavarzinella formosa* DSM 19928