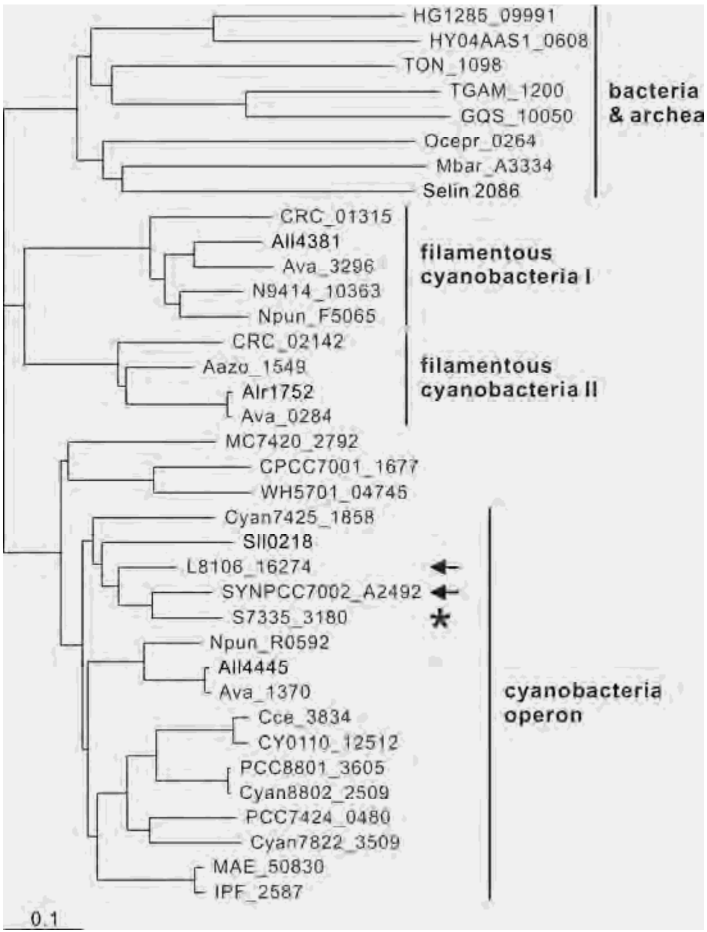
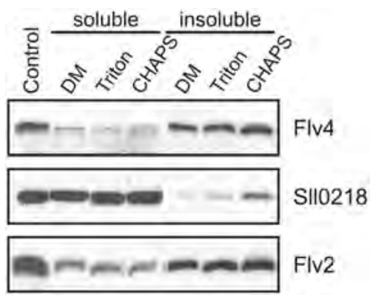


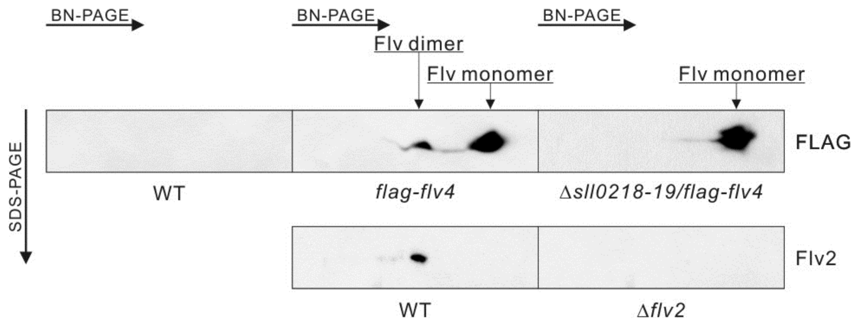
Supplemental Figure 1. Phylogenic analysis of Sll0218 in cyanobacteria, bacteria and archaea.

Amino acid sequences were retrieved from CyanoBase (http://bacteria.kazusa.or.jp/cyanobase/) and NCBI (http://www.ncbi.nlm.nih.gov/), and were named according to their locus tags. The exceptions are indicated. The arrows show the sequences with high identity with Sll0218 but are missing the *flv4* and *flv2* genes. The star indicates a Sll0218 homolog, which is not located between the *flv4* and the *flv2* genes.



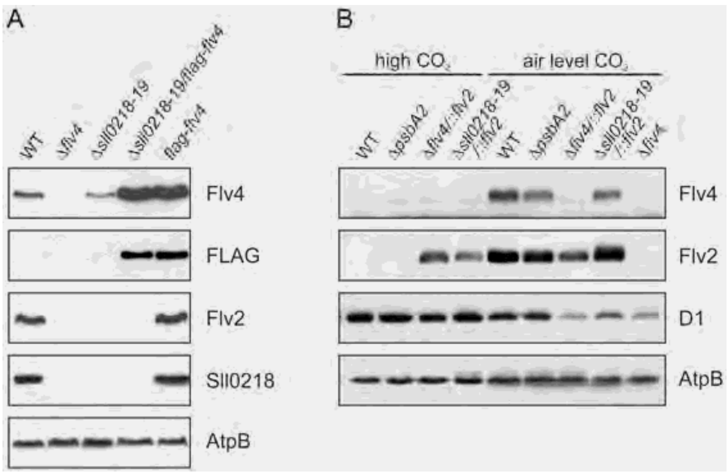
Supplemental Figure 2. Solubility of the Flv4, Sll0218 and Flv2 proteins by nonionic and zwitterionic detergents.

Total membrane of the air level CO_2 grown WT cells was isolated in Buffer B and solubilized by 2% DM, 1% Triton X-100 or 2% CHAPS according to BN PAGE protocol in Methods. The soluble and insoluble proteins were separated by centrifugation. The pellet was resuspended in water. Both soluble and insoluble materials were solubilized by Laemmli sample buffer with 6 M urea, and subjected to SDS-PAGE. Control represents the total membrane directly solubilized with the Laemmli solubilization buffer. The Flv4, Sll0218 and Flv2 proteins were detected by Western blot.



Supplemental Figure 3. BN/SDS-PAGE demonstrating the heterodimer formation by Flv2 and Flv4.

Soluble fractions were isolated from WT, Δ*flv2*, *flag-flv4* and Δ*sll0218-19*/*flag-flv4* cells, and the protein complexes were separated by BN gel. The 2D BN/SDS-PAGE and immunoblotting with the FLAG and the Flv2 antibody were subsequently performed. Only the sections of the SDS-PAGE gels corresponding to the molecular masses of the Flv2 and Flv4 proteins are shown.

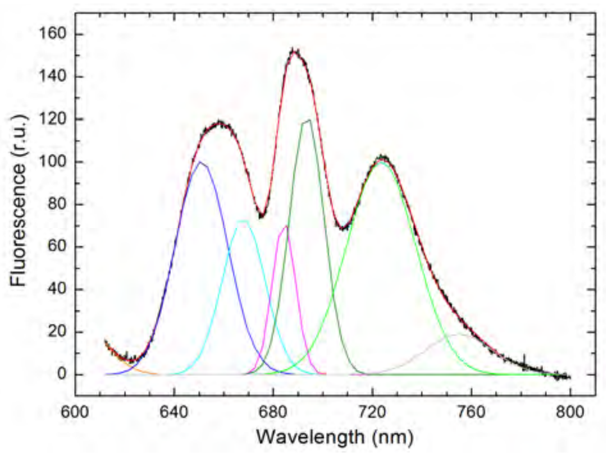


Supplemental Figure 4. Expression of Flv4, Sll0218 and Flv2 proteins in WT, *flv* mutants, the *flag-flv4* strains and the *flv2* complemented strains.

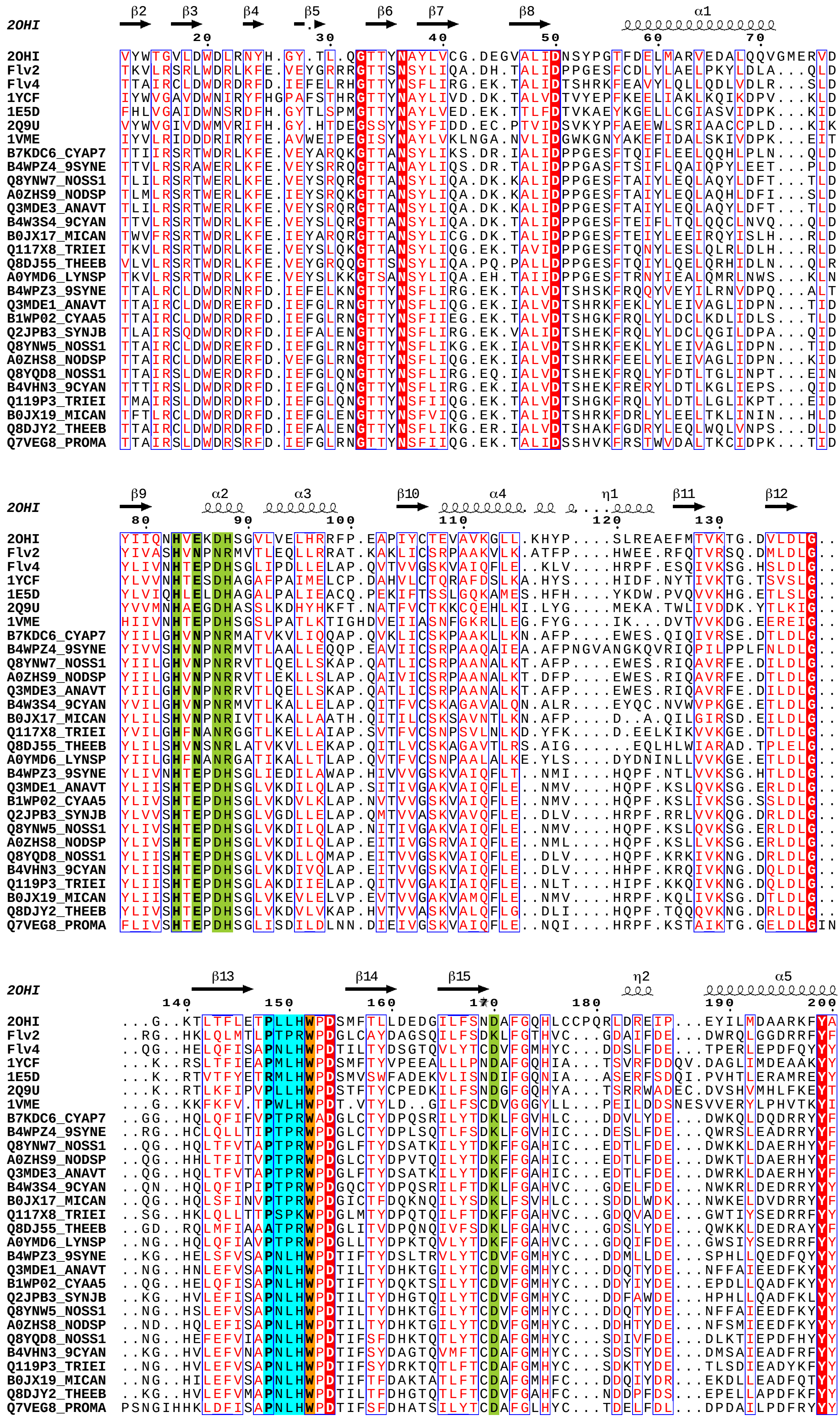
(A) Expression of the Flv4, FLAG-Flv4, Sll0218 and Flv2 proteins in WT, *flv* mutants and the *flag-flv4* strains.

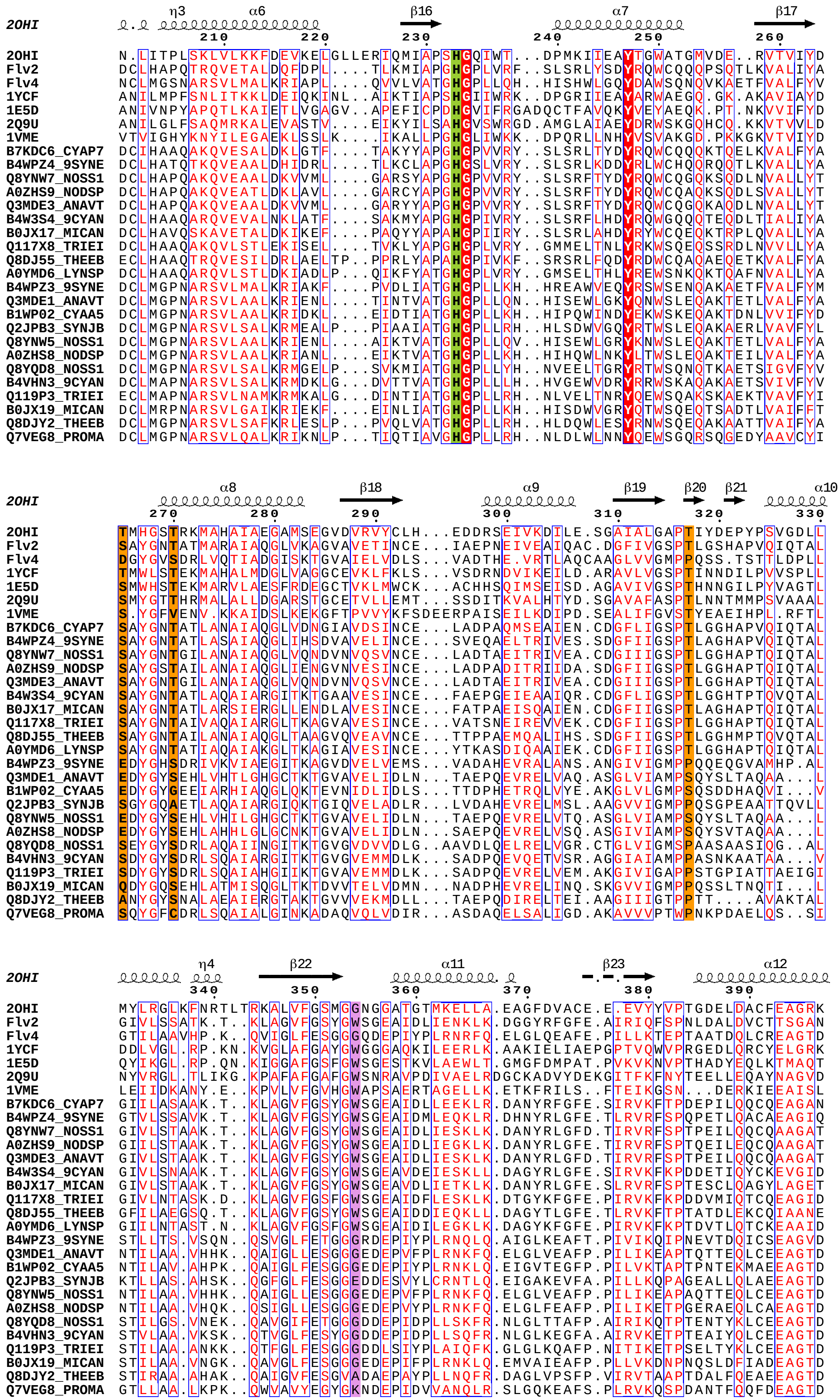
(B) Expression of the Flv4, Flv2 and D1 proteins in WT, Δ*psbA2*, Δ*flv4/::flv2* and Δ*sll0218-19/::flv2* strains.

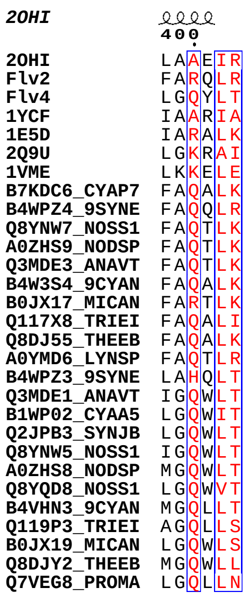
Total membranes were isolated from the WT and various *flv* mutants, and proteins separated by SDS-PAGE. The expression of the Flv4, FLAG-Flv4, Flv2, Sll0218, D1, PsaB proteins was detected by specific antibodies. ATPase β subunit represents a loading control.



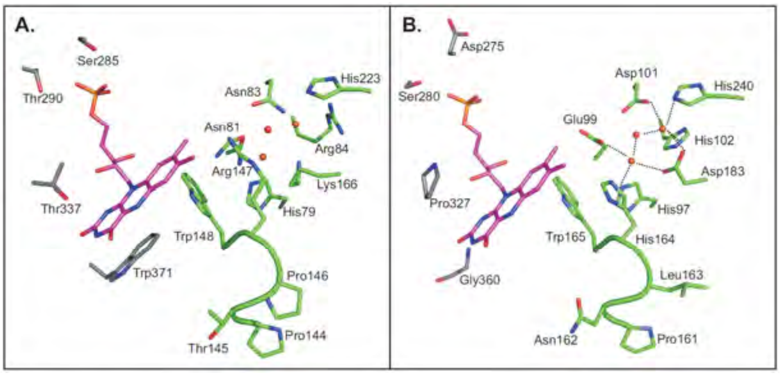
Supplemental Figure 5. An example of the Gaussian sub-band deconvolution of 77K fluorescence emission spectra exited at 580 nm in *Synechocystis* WT cells.
The black line shows the original spectrum, the red line shows the fitted spectrum by the Gaussian deconvolution. The other color lines are the Gaussian deconvolution sub-bands from the original spectrum.


2OHI
β2 β3 β4 β5 β6 β7 β8 α1
β9 α2 α3 β10 α4 η1 β11 β12
β13 β14 β15 η2 α5
2OHI
Flv2
Flv4
1YCF
1E5D
2Q9U
1VME
B7KDC6_CYAP7
B4WPZ4_9SYNE
Q8YNW7_NOSS1
A0ZHS9_NODSP
Q3MDE3_ANAVT
B4W3S4_9CYAN
B0JX17_MICAN
Q117X8_TRIEI
Q8DJ55_THEEB
A0YMD6_LYNSP
B4WPZ3_9SYNE
Q3MDE1_ANAVT
B1WP02_CYAA5
Q2JPB3_SYNJB
Q8YNW5_NOSS1
A0ZHS8_NODSP
Q8YQD8_NOSS1
B4VHN3_9CYAN
Q119P3_TRIEI
B0JX19_MICAN
Q8DJY2_THEEB
Q7VEG8_PROMA


2OHI
η3 α6 β16 α7 β17
210 220 230 240 250 260
2OHI N.LITPLSKLVLKKFDEVKELGLLERIQMIAPSHGQIWT...DPMKIIEAYTGWATGMVDE..RVTVIYD
Flv2 DCLHAPQTRQVETALDQFDPL....TLKMIAPGHGPLVRF..SLSRLTYSDYRQWCQQQPSQTLKVALIYA
Flv4 NCLMGSNARSVLMALKRIAPL....QVLVATGHGPLLQH..HISHWLGQYDAWSQNQVKAETFVALFYV
1YCF ANILMPFSNLITKKLDEIQKINL..AIKTIAPSHGIIWRK..DPGRIIEAYARWAEGQ.GK.AKAVIAYD
1E5D ANIVNPYAPQTLKAIETLVGAGV..APEFICPDHGVIFRGADQCTFAVQKYVEYAEQK.PT.NKVVIFYD
2Q9U ANILGLFSAQMRKALEVASTV...EIKYILSAHGVSWRGD.AMGLAIAEYDRWSKGQHCQ.KKVTVVLD
1VME VTVIGHYKNYILEGAEKLSSLK....IKALLPGHGLIWKK..DPQRLLNHYVSVAKGD.PKKGKVTVIYD
B7KDC6_CYAP7 DCIHAAQAKQVESALDKLGTF....TAKYYAPGHGPVVRY..SLSRLTYDYRQWCQQQKTQELKVALFYA
B4WPZ4_9SYNE DCLHATQTKQVEAALDHIDRL....TLKCLAPGHGSLVRY..SLSRLKDDYRLWCHQQRQQTLKVALLYA
Q8YNW7_NOSS1 DCLHAPQAKQVEAALDKVVML....GARSYAPGHGPVVRY..SLSRFTYDYRQWCQGQKSQDLNVALLYT
A0ZHS9_NODSP DCLHAPQAKQVEATLDKLAVL....GARCYAPGHGPVVRY..SLSRFTYDYRQWCQAQKSQDLSVALLYT
Q3MDE3_ANAVT DCLHAPQAKQVEAALDKVVML....GARYYAPGHGPVVRY..SLSRFTYDYRQWCQGQKAQDLNVALLYT
B4W3S4_9CYAN DCLHAAQARQVEVALNKLATF....SAKMYAPGHGPIVRY..SLSRFLHDYRQWGQQQTEQDLTIALIYA
B0JX17_MICAN DCLHAVQSKAVETALDKIKEF....PAQYYAPAHGPIIRY..SLSRLAHDYRYWCQEQKTRPLQVALLYA
Q117X8_TRIEI DCLHAAQAKQVLSTLEKISEL....TVKLYAPGHGPLVRY..GMMELTNLYRKWSQEQSSRDLNVVLLYA
Q8DJ55_THEEB ECLHAAQTRQVESILDRLAELTP..PPRLYAPAHGPIVKF..SRSRLFQDYRDWCQAQAEQETKVALFYA
A0YMD6_LYNSP DCLHAAQARQVLSTLDKIADLP...QIKFYAPGHGPLVRY..GMSELTHLYREWSNKQKTQAFNVALLYA
B4WPZ3_9SYNE DCLMGPNARSVLMALKRIAKF....PVDLIATGHGPLLKH..HREAWVEQYRSWSENQAKAETFVALFYM
Q3MDE1_ANAVT DCLMGPNARSVLAALKRIENL....TINTVATGHGPLLQN..HISEWLGKYQNWSLEQAKTETLVALFYA
B1WP02_CYAA5 DCLMGPNARSVLAALKRIDKL....EIDTIATGHGPLLKH..HIPQWINDYEKWSKEQAKTDNLVVIFYD
Q2JPB3_SYNJB DCLMGPNARSVLSALKRMEALP...PIAAIATGHGPLLRH..HLSDWVGQYRTWSLEQAKAERLVAVFYL
Q8YNW5_NOSS1 DCLMGPNARSVLAALKRIENL....AIKTVATGHGPLLQV..HISEWLGRYKNWSLEQAKTETLVALFYA
A0ZHS8_NODSP DCLMGPNARSVLAALKRIANL....EIKTVATGHGPLLKH..HIHQWLNKYLTWSLEQAKTEILVALFYA
Q8YQD8_NOSS1 DCLMGPNARSVLSALKRMGELP...SVKMIATGHGPLLYH..NVEELTGRYRTWSQNQTKAETSIGVFYV
B4VHN3_9CYAN DCLMAPNARSVLSALKRMDKLG...DVTTVATGHGPLLLH..HVGEWVDRYRRWSKAQAKAETSVIVFYV
Q119P3_TRIEI ECLMAPNARSVLNAMKRMKALG...DINTIATGHGPLLRH..NLVELTNRYQEWSQAKSKAEKTVAVFYI
B0JX19_MICAN DCLMRPNARSVLGAIKRIEKF....EINLIATGHGPLLKH..HISDWVGRYQTWSQEQTSADTLVAIFFT
Q8DJY2_THEEB DCLMGPNARSVLSAFKRLESLP...PVQLVATGHGPLLRH..HLDQWLESYRNWSQEQAKAATTVAIFYA
Q7VEG8_PROMA DCLMGPNARSVLQALKRIKNLP...TIQTIAVGHGPLLRH..NLDLWLNNYQEWSGQRSQGEDYAAVCYI
2OHI
α8 β18 α9 β19 β20 β21 α10
270 280 290 300 310 320 330
2OHI TMHGSTRKMAHAIAEGAMSEGVDVRVYCLH...EDDRSEIVKDILE.SGAIALGAPTIYDEPYPSVGDLL
Flv2 SAYGNTATMARAIAQGLVKAGVAVETINCE...IAEPNEIVEAIQAC.DGFIVGSPTLGSHAPVQIQTAL
Flv4 DGYGVSDRLVQTIADGISKTGVAIELVDLS...VADTHE.VRTLAQCAAGLVVGMPPQSS.TSTTLDPLL
1YCF TMWLSTEKMAHALMDGLVAGGCEVKLFKLS...VSDRNDVIKEILD.ARAVLVGSPTINNDILPVVSPLL
1E5D SMWHSTEKMARVLAESFRDEGCTVKLMWCK...ACHHSQIMSEISD.AGAVIVGSPTHNNGILPYVAGTL
2Q9U SMYGTTHRMALALLDGARSTGCETVLLEMT...SSDITKVALHTYD.SGAVAFASPTLNNTMMPSVAAAL
1VME S.YGFVENV.KKAIDSLKEKGFTPVVYKFSDEERPAISEILKDIPD.SEALIFGVSTYEAEIHPL.RFTL
B7KDC6_CYAP7 SAYGNTATLANAIAQGLVDNGIAVDSINCE...LADPAQMSEAIEN.CDGFLIGSPTLGGHAPVQIQTAL
B4WPZ4_9SYNE SAYGNTATLASAIAQGLIHSDVAVELINCE...SVEQAELTRIVES.SDGFIIGSPTLAGHAPVQIQTAL
Q8YNW7_NOSS1 SAYGNTGILANAIAQGLVQNDVNVQSVNCE...LADTAEITRIVEA.CDGIIIGSPTLGGHAPTQIQTAL
A0ZHS9_NODSP SAYGSTAILANAIAQGLIENGVNVESINCE...LADPADITRIIDA.SDGFIIGSPTLGGHAPTQIQTAL
Q3MDE3_ANAVT SAYGNTGILANAIAQGLVQNDVNVQSVNCE...LADTAEITRIVEA.CDGIIIGSPTLGGHAPTQIQTAL
B4W3S4_9CYAN SAYGNTATLAQAIARGITKTGAAVESINCE...FAEPGEIEAIAQR.CDGFLIGSPTLGGHTPTQVQTAL
B0JX17_MICAN SAYGNTATLARSIERGLLENDLAVESINCE...FATPAEISQAIEN.CDGFIIGSPTLAGHAPTQIQTAL
Q117X8_TRIEI SAYGNTAIVAQAIARGLTKAGVAVESINCE...VATSNEIREVVEK.CDGFIIGSPTLGGHAPTQIQTAL
Q8DJ55_THEEB SAYGNTAILANAIAQGLTAAGVQVEAVNCE...TTPPAEMQALIHS.SDGFIIGSPTLGGHMPTQVQTAL
A0YMD6_LYNSP SAYGNTATIAQAIAKGLTKAGIAVESINCE...YTKASDIQAAIEK.CDGFIIGSPTLGGHAPTQIQTAL
B4WPZ3_9SYNE EDYGHSDRIVKVIAEGITKAGVDVELVEMS...VADAHEVRALANS.ANGIVIGMPPQQEQGVAMHP.AL
Q3MDE1_ANAVT EDYGYSEHLVHTLGHGCTKTGVAVELIDLN...TAEPQEVRELVEA.ASGLVIAMPSQYSLTAQAA...L
B1WP02_CYAA5 EDYGYGEEIARHIAQGLQKTEVNIDLIDLS...TTDPHETRQLVYE.AKGLVLGMPSQSDDHAQVI...V
Q2JPB3_SYNJB SGYGQAETLAQAIARGIQKTGIQVELADLR...LVDAHEVRELMSL.AAGVVIGMPPQSGPEAATQVLL
Q8YNW5_NOSS1 EDYGYSEHLVHILGHGCTKTGVAVELIDLN...TAEPQEVRELVTQ.ASGLVIAMPSQYSLTAQAA...L
A0ZHS8_NODSP EDYGYSEHLAHHLGLGCNKTGVAVELIDLN...SAEPQEVRELVSQ.ASGIVIAMPSQYSVTAQAA...L
Q8YQD8_NOSS1 SEYGYSDRLAQAIINGITKTGVGVDVVDLG..AAVDLQELRELVGR.CTGLVIGMSPAASAASIQG..AL
B4VHN3_9CYAN SDYGYSDRLSQAIARGITKTGVGVEMMDLK...SADPQEVQETVSR.AGGIAIAMPPASNKAATAA...V
Q119P3_TRIEI SDYGYSDRLSQAIAHGIIKTGVAVEMMDLK...SADPQEVRELVEM.AKGIVIGAPPSTGPIATTAEIGI
B0JX19_MICAN QDYGQSEHLATMISQGLTKTDVVTELVDMN...NADPHEVRELINQ.SKGVVIGMPPQSSLTNQTI...L
Q8DJY2_THEEB ANYGYSNALAEAIERGTAKTGVVVEKMDLL...TAEPQDIRELTEI.AAGIIIGTPPTT....AVAKTAL
Q7VEG8_PROMA SQYGFCDRLSQAIALGINKADAQVQLVDIR...ASDAQELSALIGD.AKAVVVPTWPNKPDAELQS..SI
2OHI
η4 β22 α11 β23 α12
340 350 360 370 380 390
2OHI MYLRGLKFNRTLTRKALVFGSMGGNGGATGTMKELLA.EAGFDVACE.E.EVYYVPTGDELDACFEAGRK
Flv2 GIVLSSATK.T..KLAGVFGSYGWSGEAIDLIENKLK.DGGYRFGFE.AIRIQFSPNLDALDVCTTSGAN
Flv4 GTILAAVHP.K..QVIGLFESGGGQDEPIYPLRNRFQ.ELGLQEAFE.PILLKTEPTAATDQLCREAGTD
1YCF DDLVGL.RP.KN.KVGLAFGAYGWGGGAQKILEERLK.AAKIELIAEPGPTVQWVPRGEDLQRCYELGRK
1E5D QYIKGL.RP.QN.KIGGAFGSFGWSGESTKVLAEWLT.GMGFDMPAT.PVKVKNVPTHADYEQLKTMAQT
2Q9U NYVRGL.TLKIG.KPAFAFGAFGWSNRAVPDIVAELRDGCKADVYDEKGITFKFNYTEELLEQAYNAGVD
1VME LEIIDKANY.E..KPVLVFGVHGWAPSAERTAGELLK.ETKFRILS..FTEIKGSN...DERKIEAISL
B7KDC6_CYAP7 GIILASAAK.T..KLAGVFGSYGWSGEAIDLLEEKLR.DANYRFGFE.SIRVKFTPDEPILQQCQEAGAN
B4WPZ4_9SYNE GTVLSSAVK.T..KLAGVFGSYGWSGEAIDMLEQKLR.DHNYRLGFE.TLRVRFSPQPETLQACAEAGIQ
Q8YNW7_NOSS1 GIVLSTAAK.T..KLAGVFGSYGWSGEAIDLIESKLK.DANYRLGFD.TIRVRFSPTPEILQQCQAAGAT
A0ZHS9_NODSP GIILSTAAK.T..KLAGVFGSYGWSGEAIDLIEGKLK.DANYRLGFE.TIRVRFSPTQEILEQCQAAGAT
Q3MDE3_ANAVT GIVLSTAAK.T..KLAGVFGSYGWSGEAIDLIESKLK.DANYRLGFD.TIRVRFSPTPEILQQCQAAGAT
B4W3S4_9CYAN GIVLSNAAK.T..KLAGVFGSYGWSGEAVDEIESKLL.DAGYRLGFE.SIRVKFKPDDETIQYCKEVGID
B0JX17_MICAN GIVLSTAAK.T..KLAGVFGSFGWSGEAVDLIETKLK.DANYRLGFE.SLRVRFSPTESCLQAGYLAGET
Q117X8_TRIEI GIVLNTASK.D..KLAGVFGSFGWSGEAIDFLESKLK.DTGYKFGFE.PIRVKFKPDDVMIQTCQEAGID
Q8DJ55_THEEB GFILAEGSQ.T..KLAGVFGSYGWSGEAIDDIEQKLL.DAGYTLGFE.TLRVKFTPTATDLEKCQIAANE
A0YMD6_LYNSP GIILNTAST.N..KLAGVFGSFGWSGEAIDILEGKLK.DAGYKFGFE.TIRVKFKPTDVTLQTCKEAAID
B4WPZ3_9SYNE STLLTS.VSQN..QSVGLFETGGGRDEPIYPLRNQLQ.AIGLKEAFT.PIVIKQIPNEVTDQICSEAGVD
Q3MDE1_ANAVT NTILAA.VHHK..QAIGLLESGGGEDEPVFPLRNKFQ.ELGLVEAFP.PILIKEAPTQTTEQLCEEAGTD
B1WP02_CYAA5 NTILAV.AHPK..QAIGLFESGGGEDEPIYPLRNKLQ.EIGVTEGFP.PILVKTAPTPNTEKMAEEAGTD
Q2JPB3_SYNJB KTLLAS.AHSK..QGFGLFESGGEDDESVYLCRNTLQ.EIGAKEVFA.PILLKQPAGEALLQLAEEAGTD
Q8YNW5_NOSS1 NTILAA.VHHK..QAIGLLESGGGEDEPVFPLRNKFQ.ELGLVEAFP.PILIKEAPAQTTEQLCEEAGTD
A0ZHS8_NODSP NTILAA.VHQK..QSIGLLESGGGEDEPVYPLRNKFQ.ELGLFEAFP.PILIKETPGERAEQLCAEAGTD
Q8YQD8_NOSS1 STILGS.VNEK..QAVGIFETGGGDDEPIDPLLSKFR.NLGLTTAFP.AIRVKQTPTENTYKLCEEAGTD
B4VHN3_9CYAN STVLAA.VKSK..QTVGLFESYGGDDEPIDPLLSQFR.NLGLKEGFA.AIRIKETPTEATYQLCEEAGTD
Q119P3_TRIEI STILAA.ANKK..QTFGLFESGGGDDLSIYPLAIQFK.GLGLKQAFP.NITIKETPSELTYKLCEEAGTD
B0JX19_MICAN STILAA.VNGK..QAVGLFESGGGEDEPIFPLRNKLQ.EMVAIEAFP.PLLVKDNPNQSLDFIADEAGTD
Q8DJY2_THEEB STIRAA.AHAK..QAIGVFESGVADAEPAYPLLNQFR.DAGLVPSFP.VIRVTAAPTDALFQEAEEAGTD
Q7VEG8_PROMA GTLLAA.LKPK..QWVAVYEGYGKNDEPIDVVANQLR.SLGQKEAFS.PLRVKQSPDANTFQQFDEAGTD



Supplemental Figure 6. Multiple structure-based alignment of *Methanothermobacter marburgensis* $F_{420}H_2$ oxidase (PDB ID: 2OHI), *Synechocystis* Flv2, *Synechocystis* Flv4, *Moorella thermoacetica* FprA (PDB ID: 1YCF), *Desulfovibrio gigas* rubredoxin oxygen:oxidoreductase (PDB ID: 1E5D), *Giardia intestinalis* flavoprotein (PDB ID: 2Q9U), *Thermotoga maritima* flavoprotein (PDB ID: 1VME). The amino acid numbering is according to Flv2. The cyanobacterial sequences are included with UniProt Knowledgebase accession codes. The secondary structure above the alignment is according to 2OHI. The switch loop is colored cyan, the iron-binding residues are green, and Trp corresponding to Trp371 in Flv2 is pink.



Supplemental Figure 7. The FMN and diiron binding sites of Flv2 and Flv4 homodimers.

(A) *Synechocystis* Flv2/Flv2 homodimer in closed formation.

(B) *Synechocystis* Flv4/Flv4 homodimer in closed formation.

Supplemental Table 1. Ratios of low temperature (77K) fluorescence yields of PBS, PSI and PSII (F_{685} + F_{695}) of WT and various *flv* mutants excited at 580 nm light

Strain	F_{PBS}/F_{PSII}	F_{PBS}/F_{PSI}	F_{685}/F_{695}	F_{695}/F_{PSI}	F_{PBS}/F_{695}
WT	1.50 ± 0.03	1.24 ± 0.02	0.38 ± 0.03	0.60 ± 0.02	2.06 ± 0.04
Δ*flv2*	1.30 ± 0.04	1.24 ± 0.03	0.85 ± 0.05	0.51 ± 0.02	2.45 ± 0.09
Δ*sll0218-19*	1.12 ± 0.03	1.25 ± 0.03	0.96 ± 0.04	0.57 ± 0.01	2.18 ± 0.06
Δ*flv4*	1.12 ± 0.04	1.26 ± 0.05	1.02 ± 0.07	0.57 ± 0.02	2.22 ± 0.13
Δ*sll0218-19/flag-flv4*	1.18 ± 0.03	1.24 ± 0.04	0.83 ± 0.01	0.58 ± 0.01	2.15 ± 0.04
flag-flv4	1.68 ± 0.10	1.19 ± 0.08	0.44 ± 0.05	0.49 ± 0.02	2.42 ± 0.13

The quantification was performed from four independent measurements. The results are shown as mean value ± SD. Peaks are indicated in Supplemental Figure 4.

Supplemental Table 2. Conserved metal binding sites on the Flv2/Flv4 heterodimer surface

Metal binding site	Conserved residues in Flv2/Flv4 heterodimer	Template	Corresponding residues in template
Ca^{2+}	Asp404, Glu400 in Flv4	*Synechococcus sp.* flavodoxin-like domain	Asp 397, Glu393
Zn^{2+}	Glu80, Asp84 in Flv2	*M. thermoacetica* FprA	Glu55, Glu59
	Glu148 in Flv2		Asp120
	Asp289 in Flv4		His271, Asp275
putative	His246, His247, His 250 in Flv4	-	-
	His27, His153, Asp173 in Flv4	-	-
	His143, Glu145 in Flv2	-	-

Supplemental Table 3. Kinetic data of flash induced fluorescence relaxation components of Δ*psbA2* and two *flv2* complemented strains grown at high and air level of CO_2.

	Fast		Middle		Slow	
	T1 (ms)	A1 (%)	T2 (ms)	A2 (%)	T3 (s)	A3 (%)
High CO_2			No addition			
Δ*psbA2*	0.443 ± 0.009	56 ± 0.8	3.4 ± 0.17	28 ± 1.0	17.3 ± 1.0	16 ± 0.3
Δ*flv4/::flv2*	0.450 ± 0.025	57 ± 1.8	3.1 ± 0.22	28 ± 1.4	14.0 ± 0.4	15 ± 1.0
Δ*sll0218-19/::flv2*	0.394 ± 0.006	57 ± 1.4	2.9 ± 0.19	27 ± 1.1	17.1 ± 1.6	16 ± 0.7
			+ DBMIB			
Δ*psbA2*	1.059 ± 0.094	46 ± 0.4	31.9 ± 1.3	36 ± 0.7	3.4 ± 0.4	18 ± 0.6
Δ*flv4/::flv2*	1.135 ± 0.082	49 ± 1.3	34.9 ± 0.4	32 ± 2.0	4.7 ± 0.8	19 ± 0.7
Δ*sll0218-19/::flv2*	1.129 ± 0.131	51 ± 1.0	32.5 ± 1.2	30 ± 1.5	4.5 ± 0.4	19 ± 0.5
Air level of CO_2			No addition			
Δ*psbA2*	0.634 ± 0.010	67 ± 1.3	9.3 ± 1.7	17 ± 1.6	5.0 ± 0.5	16 ± 0.4
Δ*flv4/::flv2*	0.762 ± 0.042	54 ± 2.1	8.7 ± 0.7	19 ± 1.1	4.1 ± 0.8	27 ± 1.3
Δ*sll0218-19/::flv2*	0.482 ± 0.032	67 ± 0.3	7.2 ± 1.0	18 ± 1.2	2.4 ± 0.4	15 ± 1.0
			+ DBMIB			
Δ*psbA2*	0.757 ± 0.016	53 ± 1.4	29.1 ± 1.3	29 ± 1.0	1.3 ± 0.1	18 ± 0.4
Δ*flv4/::flv2*	0.995 ± 0.025	39 ± 1.2	27.1 ± 0.3	29 ± 1.3	0.7 ± 0.1	32 ± 2.0
Δ*sll0218-19/::flv2*	0.637 ± 0.007	48 ± 1.2	23.4 ± 1.0	30 ± 1.8	0.5 ± 0.1	22 ± 1.4