(CNN)

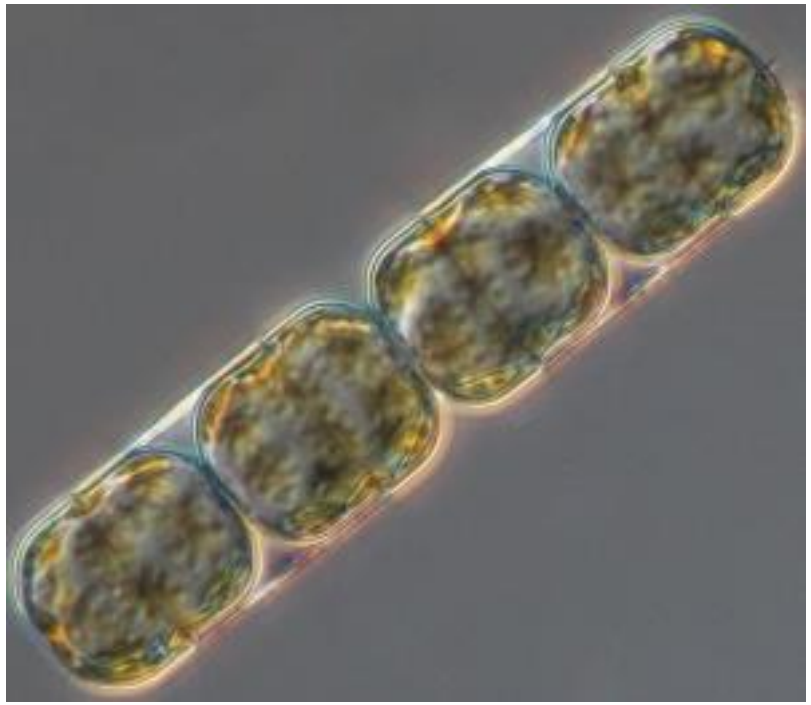
(The Guardian)

Fish deaths


Algae= phyto plankton
phyton planktos
"Plant wanderers"
human hair width:
0.1 mm
(Durkin)

Found across water environments: seawater, freshwater, ice/snow

Exist as a single cell, or chain of cells



Over a million phytoplankton in a teaspoon!

(Slide from C-MORE)(UBC EOAS)

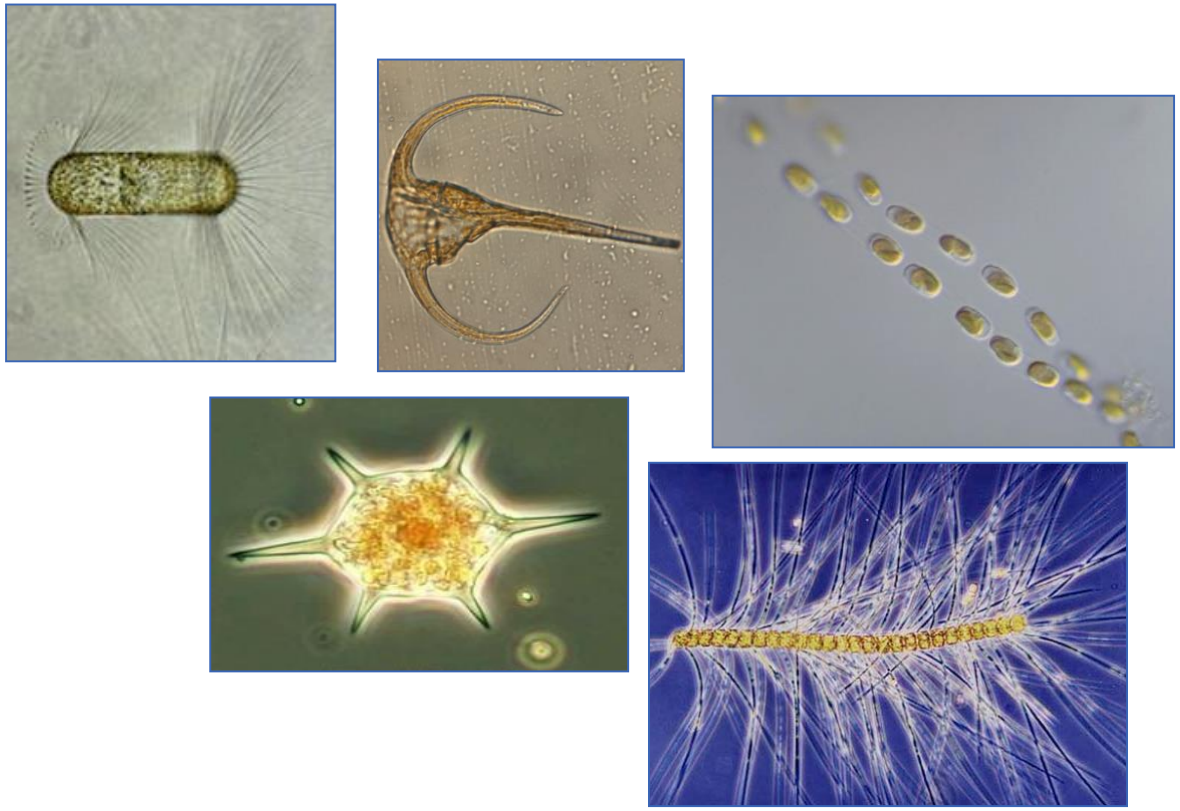
Found across water environments: seawater, freshwater, ice/snow

Span a range of sizes and shapes: 0.0001 – 10s of mm

(NASA Earth Observatory)

What makes them “wanderers”?

Phytoplankton live near the surface of the ocean because they need sunlight to make food



More likely to float in the sunlit depths of the ocean:

(Slide from C-MORE)

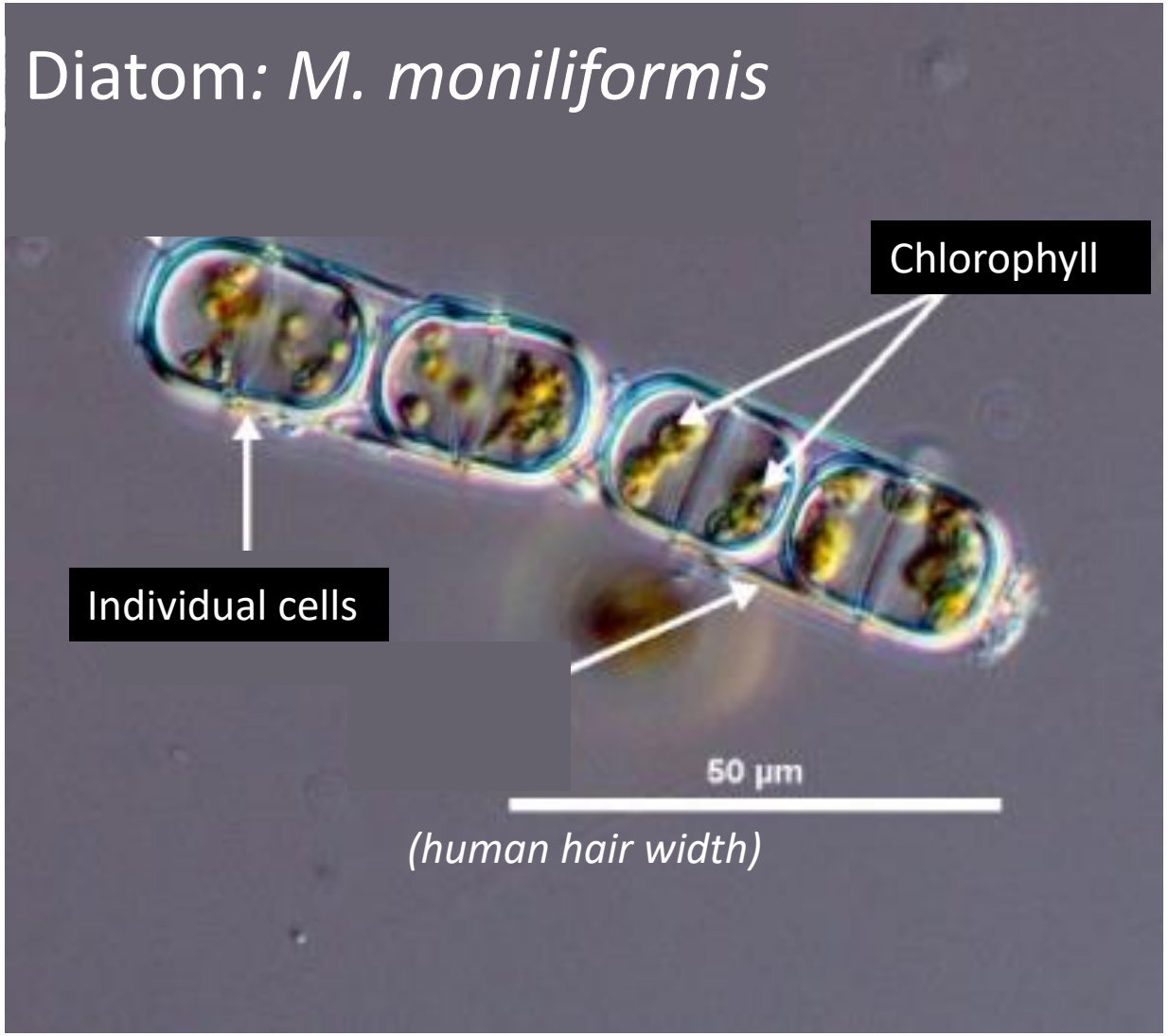
What makes them “plants”?

Photosynthesis:

$$6\underline{C}O_2 + 6H_2O \rightarrow \underline{C}_6H_{12}O_6 + 6O_2$$

CARBON DIOXIDE GAS

ORGANIC TISSUE



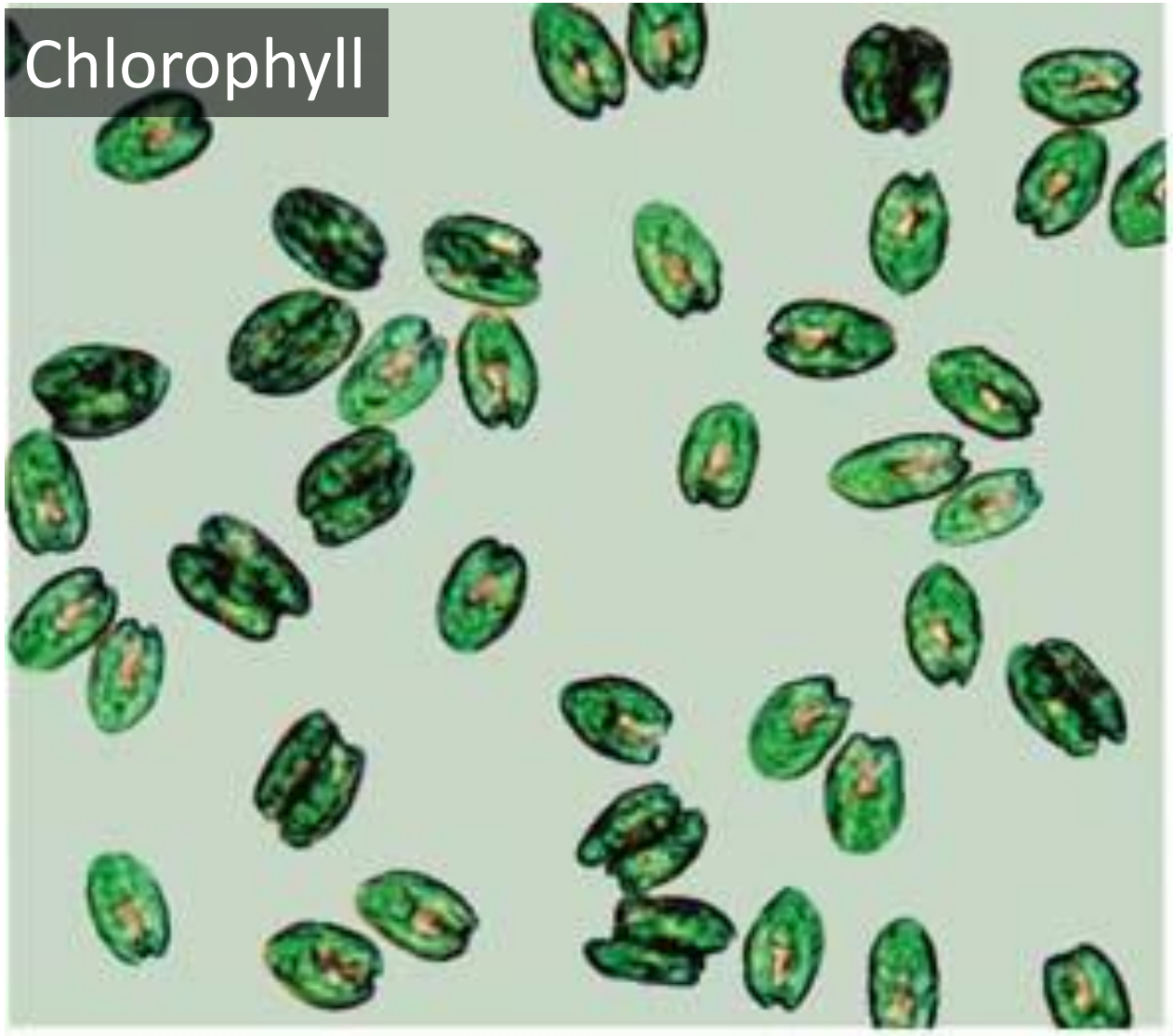
(UBC EOAS)

What makes them “plants”?

Photosynthesis:

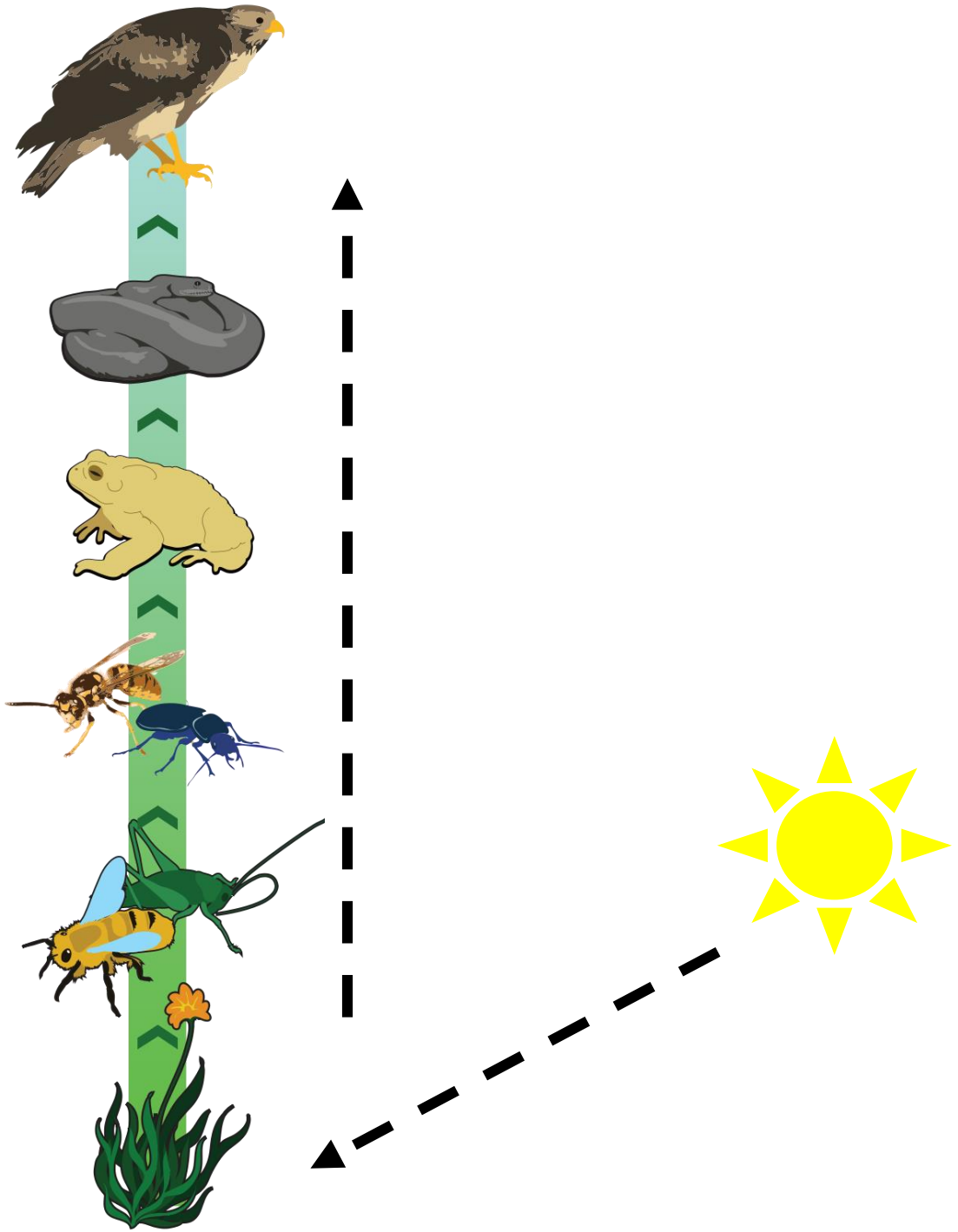
$6\underline{C}O_2 + 6H_2O \rightarrow \underline{C}_6H_{12}O_6 + 6O_2$

This pigment captures energy from the sun



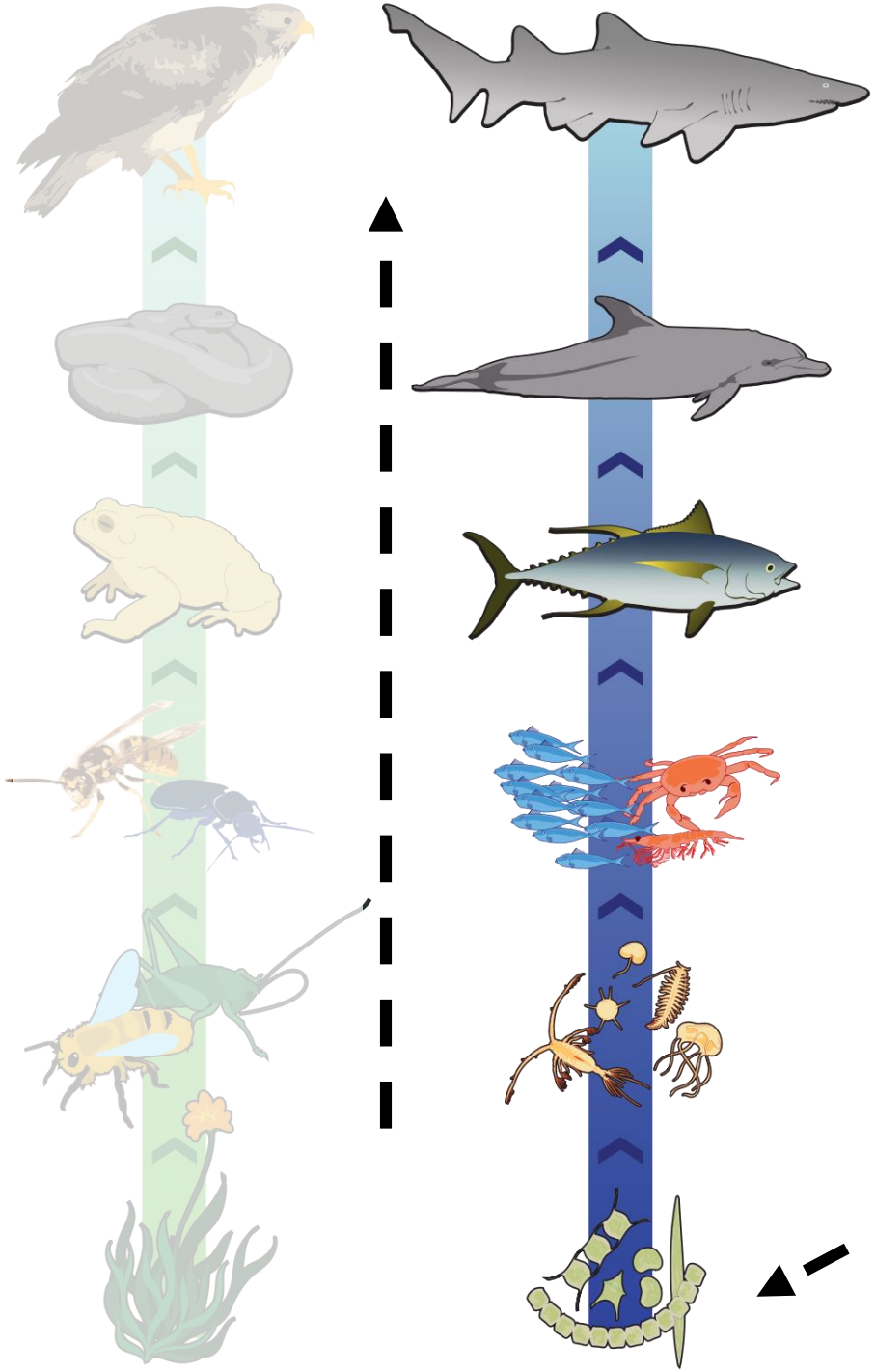
(The UN FAO)

Plants are the foundation of food chains on land



(Villarreal)

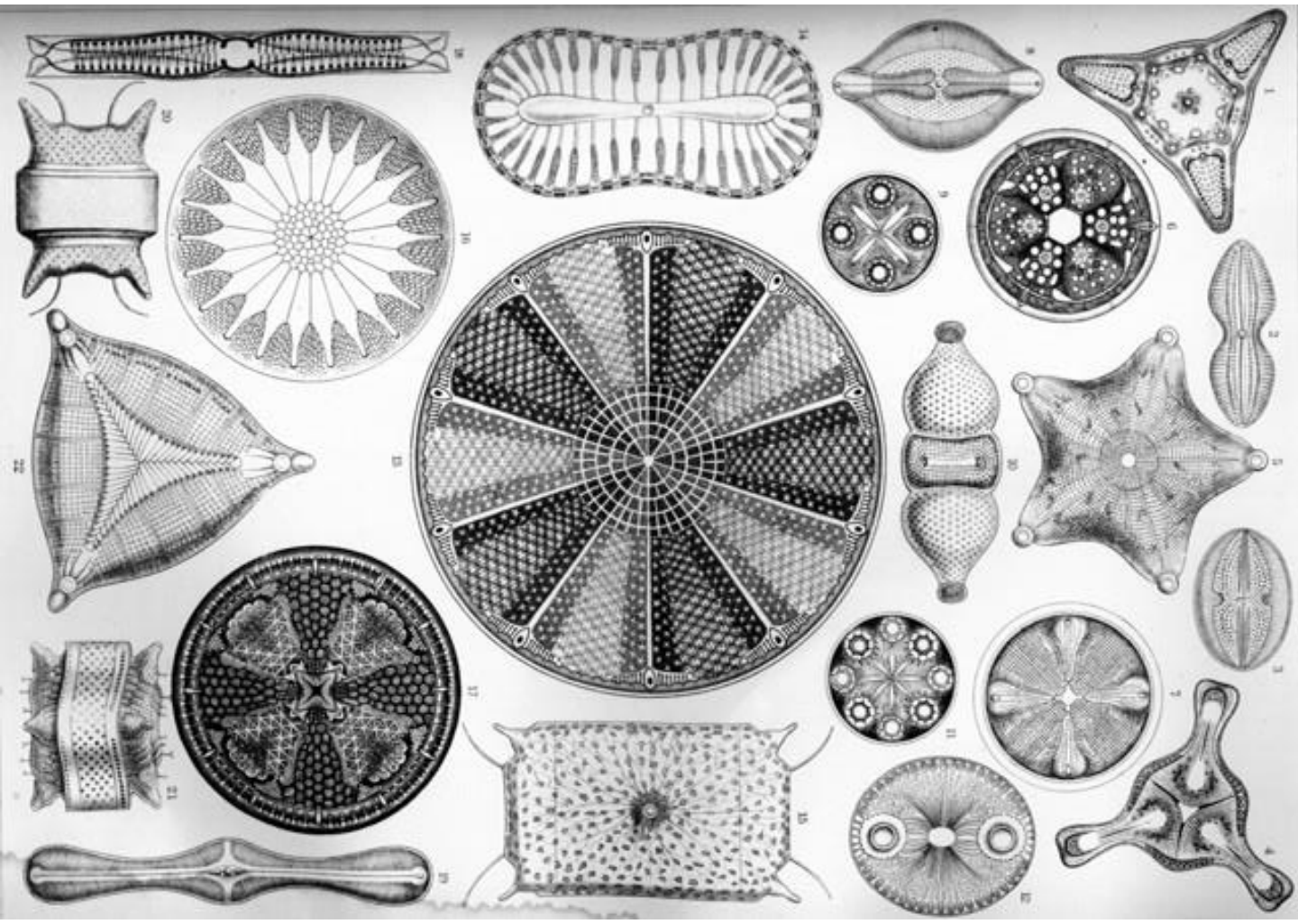
Algae are the foundation of food chains in the ocean

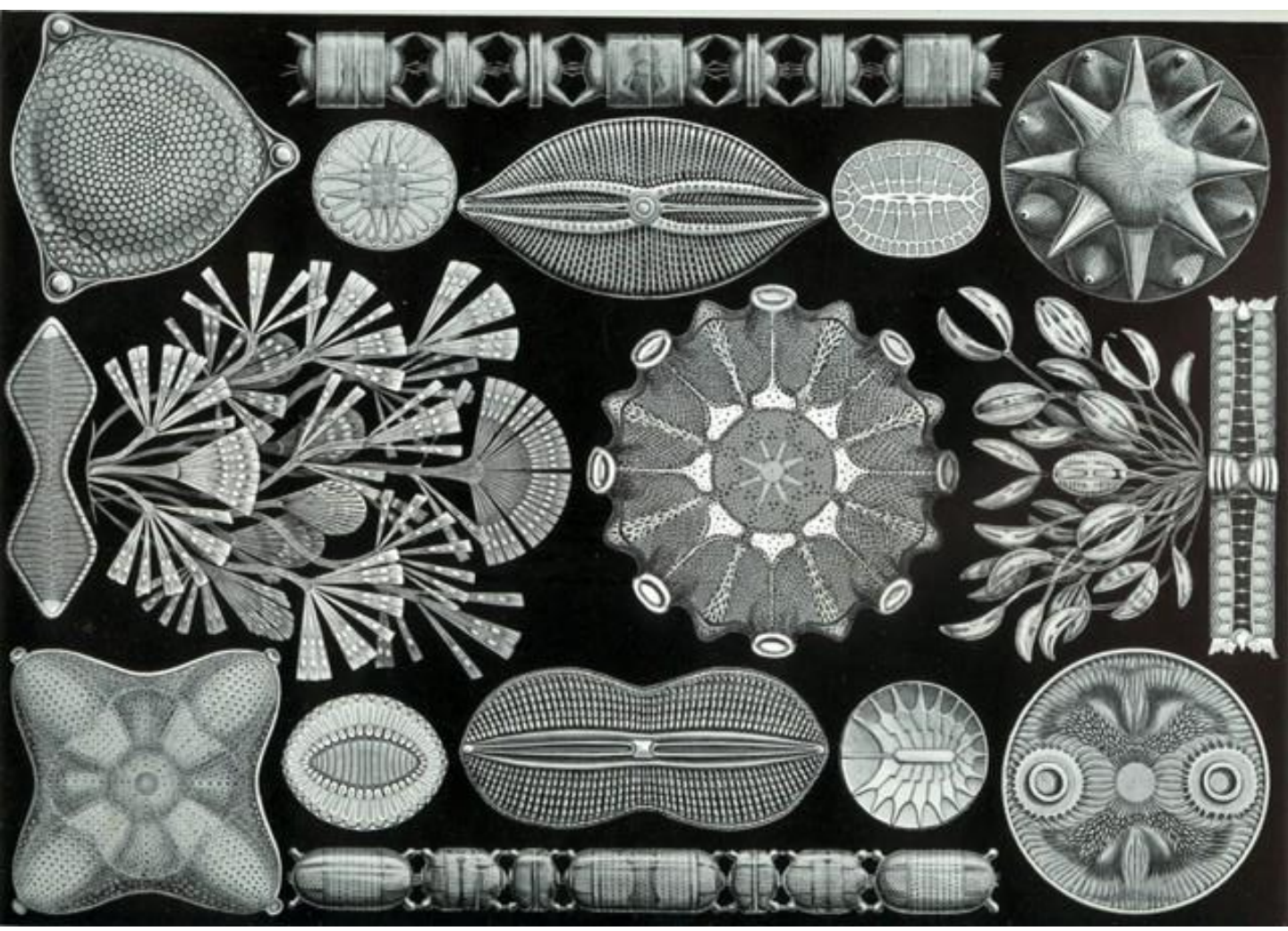


Yellowfin Tuna

(Villarreal)


With microscopes, algae diversity fascinated scientists and artists for >100 years
(http://microscopist.net/MollerJD.html)





(http://www.silentplankton.com/Gallery/View/Haeckel)

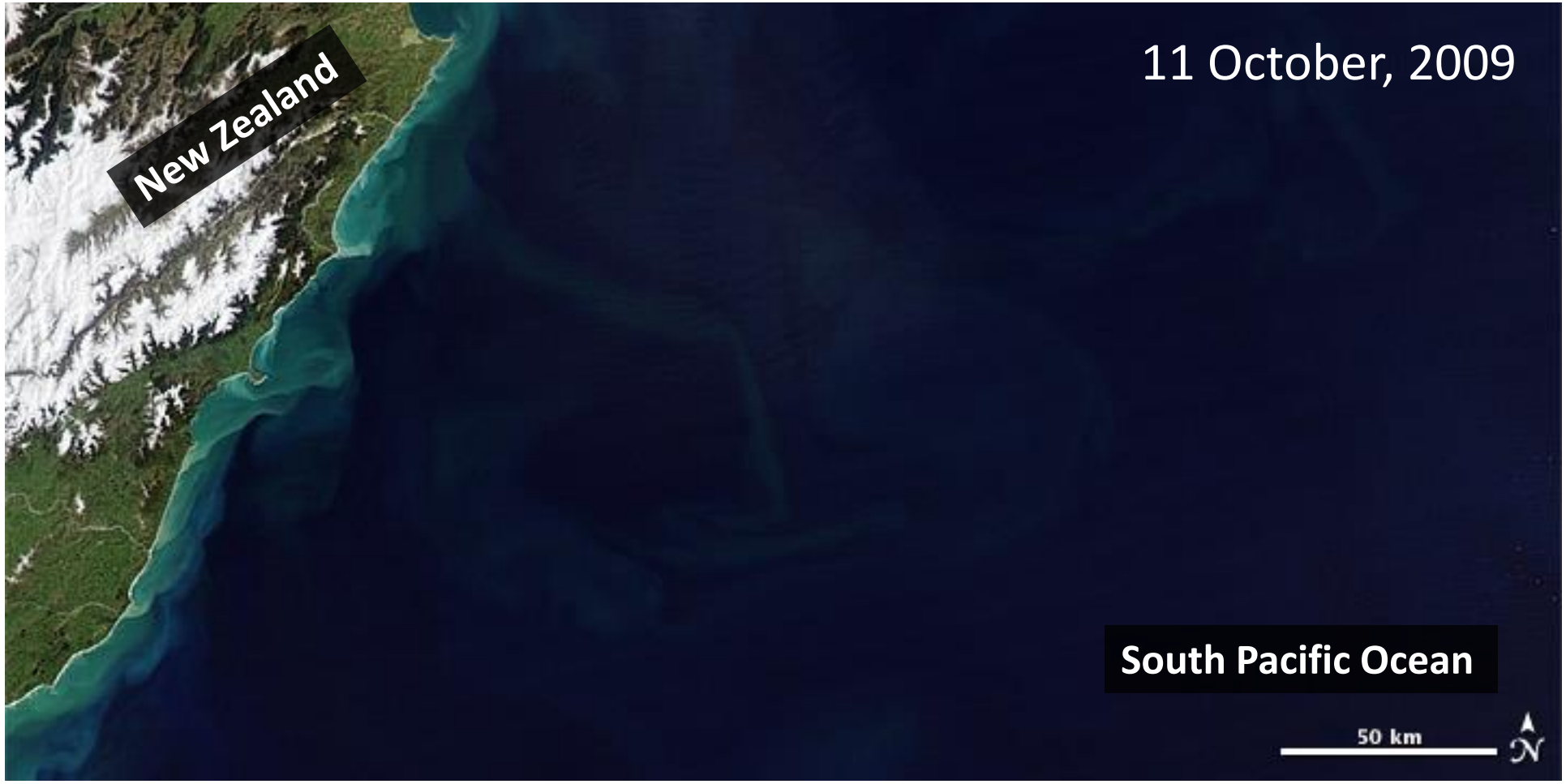
For each slide,

1. Note what specimen you have
2. Note the microscope’s magnification
3. Draw what you see
4. Write observations describing what you see

Satellites today help us observe phytoplankton over larger spaces

(NASA Earth Observatory)

And their changes through time

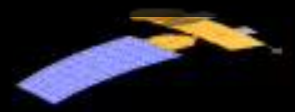


(NASA Earth Observatory)

And their changes through time

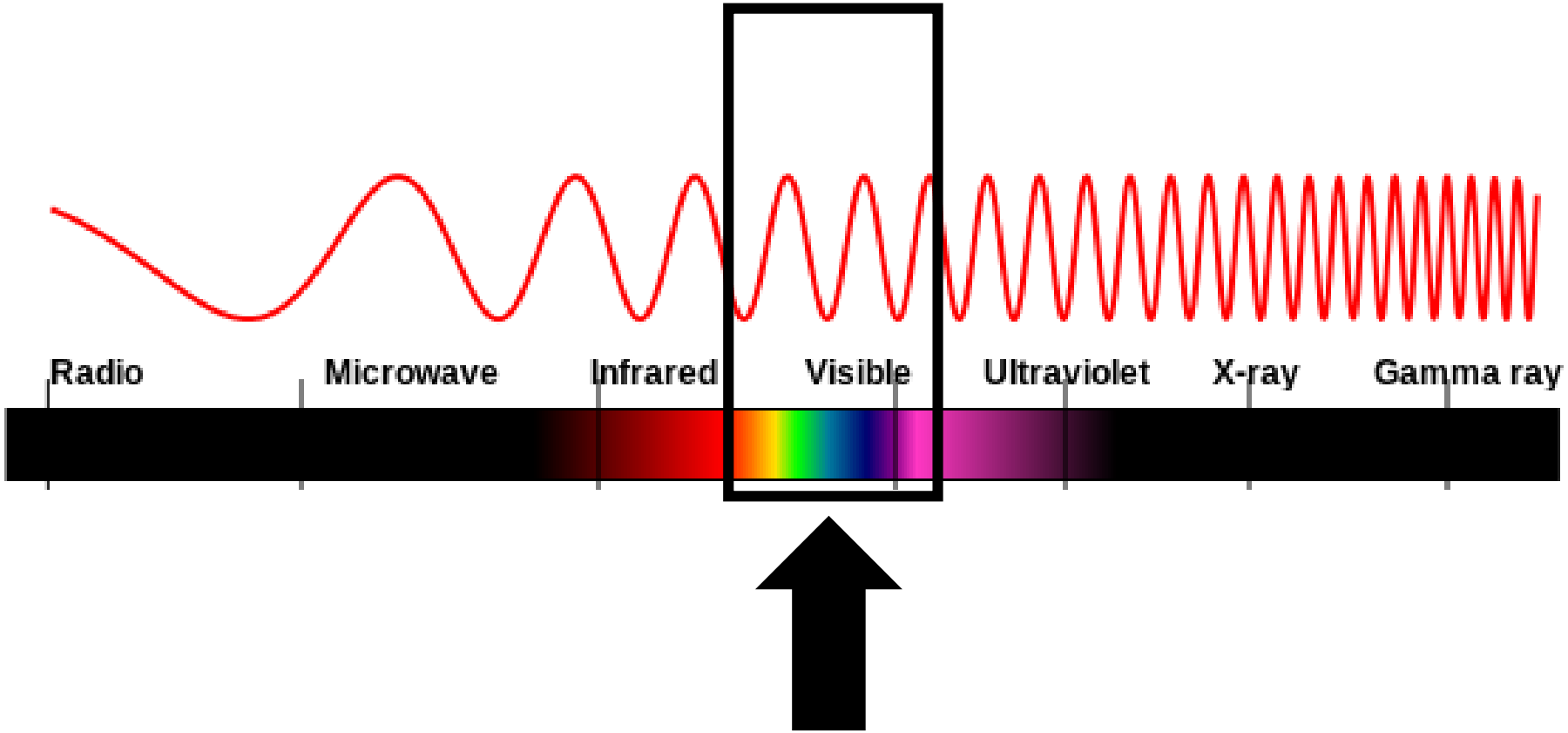
(NASA Earth Observatory)

Different NASA satellites have monitored global ocean algae since 1978



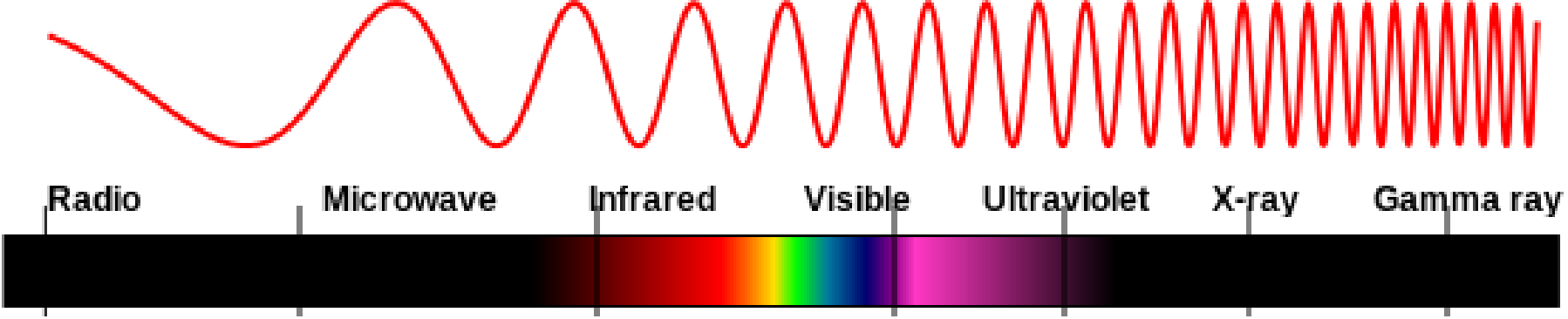

What do the satellites “see”?

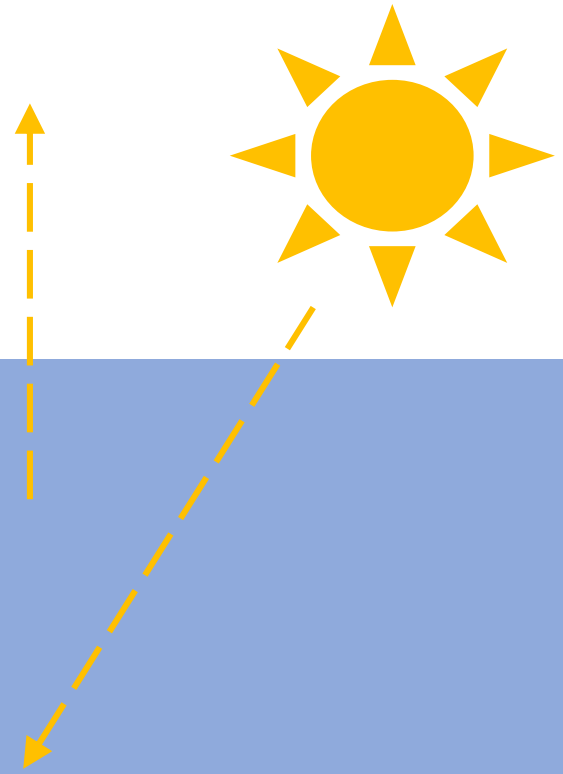
Satellites “see” the radiation coming from ocean



Visible light radiation:
What our eyes see

(NASA)



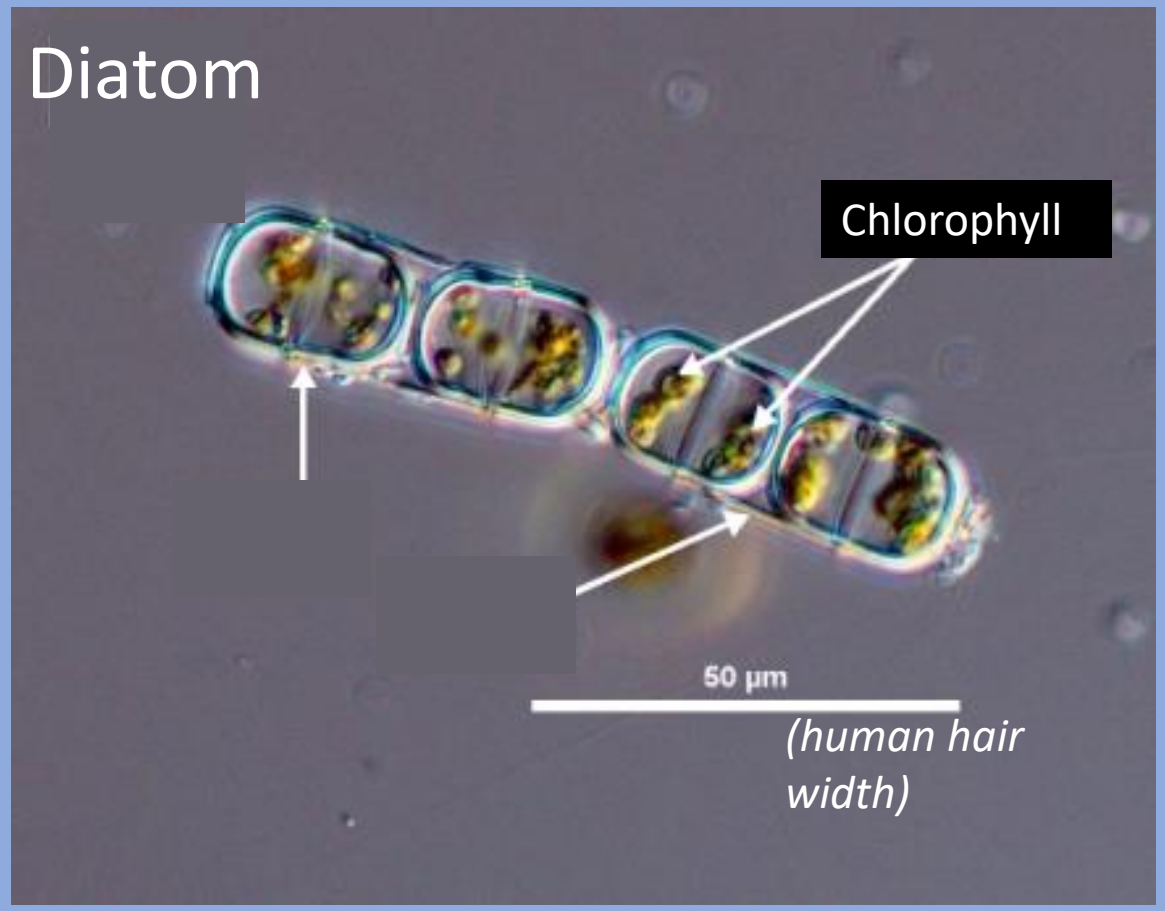


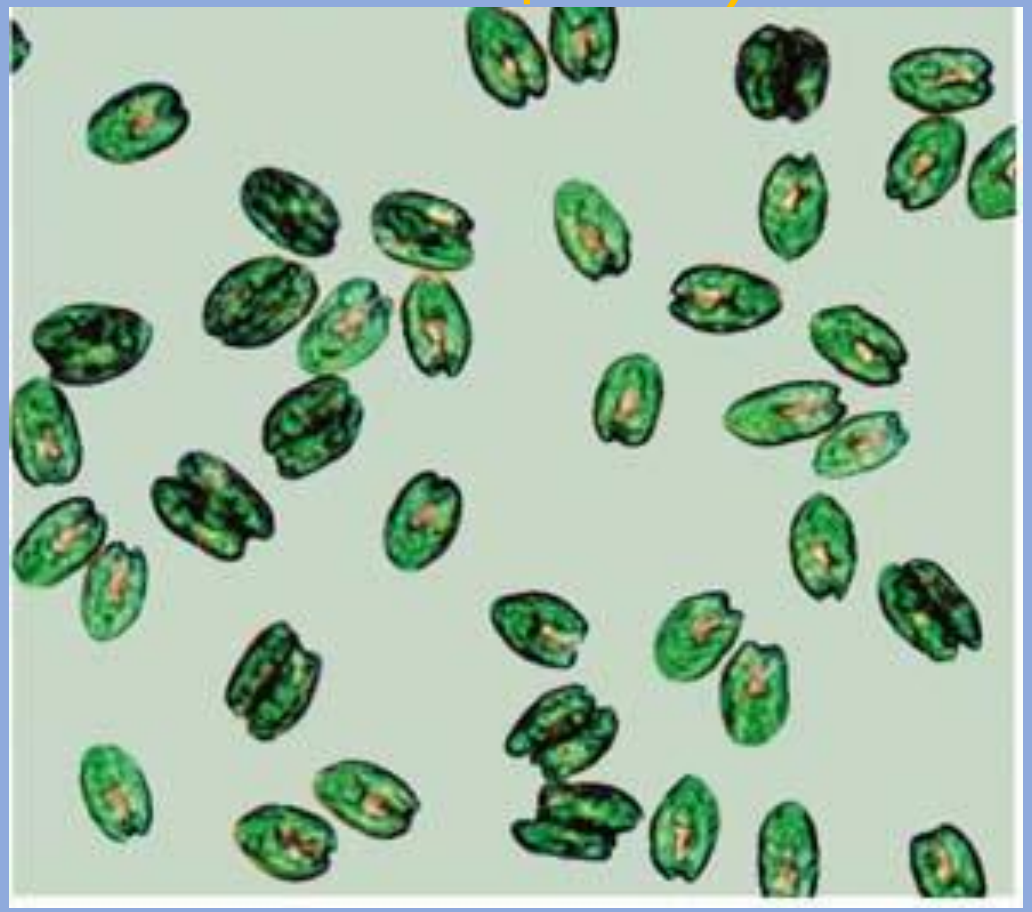
Radiation from sun/space enters the ocean, passes through seawater.

Different radiation released back to space

(NASA)

Radiation from ocean tells us # algae living there





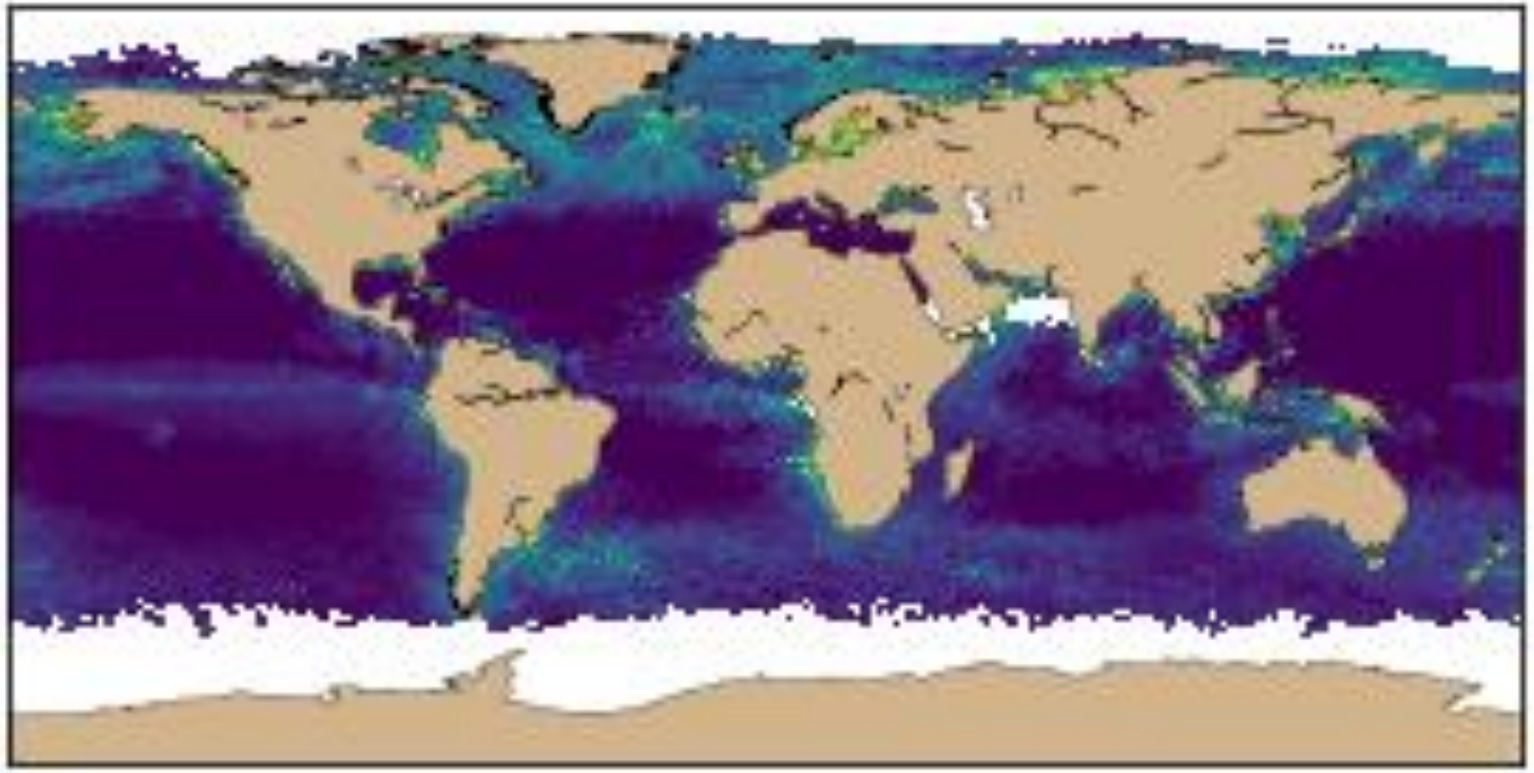
(The UN FAO; UBC EOAS)

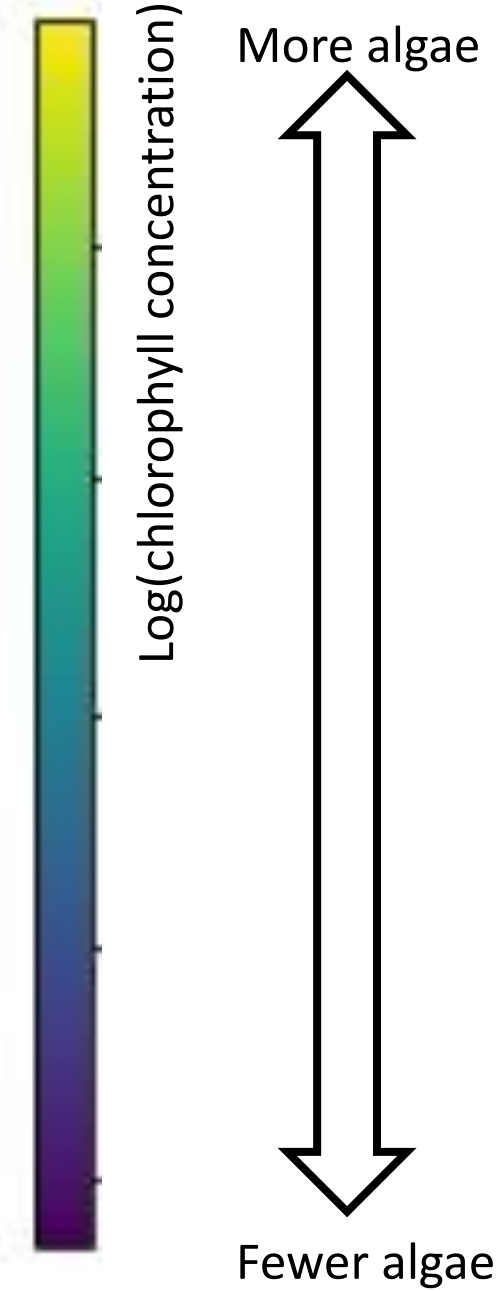
Chl_a.A20171212017151

	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227
49	0.3699	0.3929	0.3975	0.4627	0.4948	0.4248	0.4000	0.4221	0.3951	0.3983	0.3861	0.3912	0.3803	0.3929	0.3939	0.4167	0.4145	0.3939
50	0.3586	0.3854	0.4037	0.5088	0.4782	0.4358	0.3976	0.4128	0.4128	0.3992	0.3892	0.3974	0.3800	0.3874	0.3985	0.4220	0.4191	0.3992
51	0.3581	0.3686	0.4033	0.4230	0.4596	0.4342	0.3773	0.4078	0.4115	0.4025	0.3916	0.3970	0.3796	0.3829	0.3913	0.4247	0.4257	0.4201
52	0.3576	0.3696	0.3876	0.3844	0.4128	0.4323	0.3831	0.4074	0.4104	0.3946	0.3990	0.3966	0.3656	0.3776	0.3915	0.4220	0.4315	0.4168
53	0.3539	0.3703	0.3827	0.3609	0.4029	0.4251	0.3934	0.4014	0.3858	0.3878	0.3926	0.3950	0.3635	0.3758	0.3920	0.4210	0.4427	0.4146
54	0.3568	0.3575	0.3774	0.3668	0.4273	0.4221	0.4100	0.3857	0.3821	0.3851	0.3875	0.3985	0.3862	0.3767	0.3834	0.4190	0.4325	0.3946
55	0.3726	0.3597	0.3745	0.3730	0.4357	0.4228	0.4186	0.3823	0.3774	0.3846	0.3847	0.4036	0.3889	0.4026	0.3789	0.4030	0.4074	0.3898
56	0.3648	0.4206	0.3774	0.3843	0.4752	0.4279	0.4174	0.3798	0.3820	0.3840	0.3864	0.4119	0.3932	0.4061	0.3794	0.3928	0.4090	0.3819
57	0.3568	0.3976	0.4287	0.3870	0.4328	0.4519	0.4312	0.4236	0.3853	0.3893	0.3997	0.4094	0.3856	0.4147	0.3879	0.4045	0.4100	0.3951
58	0.3492	0.3803	0.3997	0.3832	0.4194	0.4196	0.4784	0.4188	0.3852	0.3944	0.4126	0.3854	0.3822	0.4024	0.4170	0.4072	0.3944	0.4035
59	0.3500	0.3680	0.3822	0.3842	0.3674	0.4122	0.4132	0.3977	0.3876	0.3956	0.4283	0.3761	0.3762	0.3990	0.4191	0.4112	0.3943	0.3977
60	0.3589	0.3663	0.3791	0.3853	0.3[illegible]	0.[illegible]	0.[illegible]	0.[illegible]	0.[illegible]	0.[illegible]	0.[illegible]	0.[illegible]	0.[illegible]	0.[illegible]	0.4163	0.4001	0.3945	0.4027
61	0.3651	0.3679	0.3789	0.3797	0.3566	0.3623	0.3476	0.3505	0.3922	0.3831	0.3748	0.3561	0.3640	0.3783	0.3830	0.3947	0.3873	0.4166
62	0.3711	0.3729	0.3820	0.3772	0.3[illegible]	0.3604	0.3451	0.3122	0.3870	0.3722	0.3514	0.3523	0.3473	0.3497	0.3719	0.3711	0.3842	0.4222
63	0.3378	0.3773	0.3800	0.3651	0.3[illegible]	0.[illegible]	0.[illegible]	0.[illegible]	0.[illegible]	0.[illegible]	0.[illegible]	0.[illegible]	0.[illegible]	0.[illegible]	0.3605	0.3656	0.4019	0.4256
64	0.3357	0.3808	0.3774	0.3627	0.3498	0.3421	0.3380	0.3327	0.3892	0.3781	0.3523	0.3537	0.3553	0.3567	0.3557	0.3584	0.3965	0.4145
65	0.3638	0.3840	0.3717	0.3577	0.3450	0.3261	0.3365	0.3477	0.3958	0.3861	0.3701	0.3599	0.3592	0.3584	0.3543	0.3498	0.3881	0.4110
66	0.3831	0.4110	0.3683	0.3508	0.3[illegible]	0.[illegible]	0.[illegible]	0.[illegible]	0.[illegible]	0.[illegible]	0.[illegible]	0.[illegible]	0.[illegible]	0.3578	0.3532	0.3472	0.3815	0.4055
67	0.4290	0.4152	0.3620	0.3465	0.3400	0.3208	0.3280	0.3179	0.3692	0.3752	0.3745	0.3644	0.3681	0.3571	0.3499	0.3621	0.3803	0.3671
68	0.4198	0.4234	0.3617	0.3545	0.3405	0.3236	0.3096	0.3088	0.3787	0.3580	0.3630	0.3608	0.3716	0.3719	0.3437	0.3562	0.3944	0.3563
69	0.4172	0.3923	0.3610	0.3545	0.3325	0.3257	0.3239	0.2805	0.3477	0.3391	0.3534	0.3623	0.3863	0.3718	0.3477	0.3447	0.3804	0.4170
70	NaN	0.3629	0.3224	NaN	0.3268	0.3243	0.3312	0.3277	0.3169	0.3314	0.3376	0.3637	0.3731	0.3451	0.3470	0.3430	0.3330	0.4170
71	0.3150	0.3243	0.3165	0.3259	0.3188	0.3220	0.3159	0.3345	0.3228	0.3103	0.3318	0.3457	0.3576	0.3451	0.3258	0.3423	0.3330	NaN
72	0.3150	0.3249	0.3231	0.3262	0.3216	0.3158	0.3233	0.3283	0.3259	0.3063	0.3137	0.3386	0.3576	NaN	0.3258	NaN	NaN	NaN
73	0.3155	0.3255	0.3261	0.3315	0.3231	0.3163	0.3428	0.3350	0.3387	0.3023	0.2783	NaN	NaN	NaN	NaN	NaN	NaN	NaN
74	0.3178	0.3267	0.3323	0.3327	0.3282	0.3165	0.3674	0.3781	0.3521	0.3723	0.2332	0.2322	NaN	NaN	NaN	NaN	NaN	NaN
75	0.3271	0.3275	0.3364	0.3345	0.3291	NaN	0.3867	0.3957	0.3856	0.3906	0.2246	0.2322	NaN	NaN	NaN	NaN	NaN	NaN
76	0.3316	0.3317	0.3368	0.3307	0.3308	0.4022	0.3810	0.4014	0.3855	0.4028	0.2207	0.3111	NaN	NaN	NaN	NaN	NaN	NaN
77	0.3376	0.3263	0.3208	0.3289	0.3247	0.4022	0.3821	0.3699	0.3849	0.4028	0.2017	0.3197	NaN	NaN	NaN	NaN	NaN	NaN
78	0.3363	0.3155	0.3246	0.3245	0.3231	0.3598	0.3858	0.3573	0.3255	NaN	0.3215	NaN	NaN	NaN	NaN	NaN	NaN	NaN
79	0.3359	0.3246	0.3282	0.3332	0.3353	0.3486	0.3500	0.3434	0.3237	0.3530	0.3873	NaN	NaN	0.3346	0.3318	NaN	NaN	NaN
80	0.3352	0.3297	0.3307	0.3453	0.3359	0.3386	0.3444	0.3370	0.3223	0.3482	0.3395	NaN	0.3296	0.3346	0.3318	NaN	NaN	NaN
81	0.3354	0.3386	0.3305	0.3422	0.3368	0.3346	0.3230	0.3348	0.3316	0.3404	0.3425	0.3263	0.3296	0.3394	NaN	NaN	NaN	NaN
82	0.3357	0.3316	0.3214	0.3403	0.3377	0.3281	0.3278	0.3357	0.3364	0.3541	0.3459	0.3279	0.3241	0.3417	0.3540	NaN	NaN	NaN
83	0.3349	0.3232	0.3194	0.3314	0.3382	0.3474	0.3361	0.3378	0.3582	0.3603	0.3415	0.3310	0.3260	0.3541	0.3540	0.3186	NaN	0.3273
84	0.3315	0.3186	0.3148	0.3301	0.3411	0.3551	0.3459	0.3414	0.3546	0.3455	0.3393	0.3309	0.3296	0.3535	0.3409	0.3186	0.2767	0.3273

Satellites divide the ocean surface into millions of tiny sections, recording the number of algae in each section

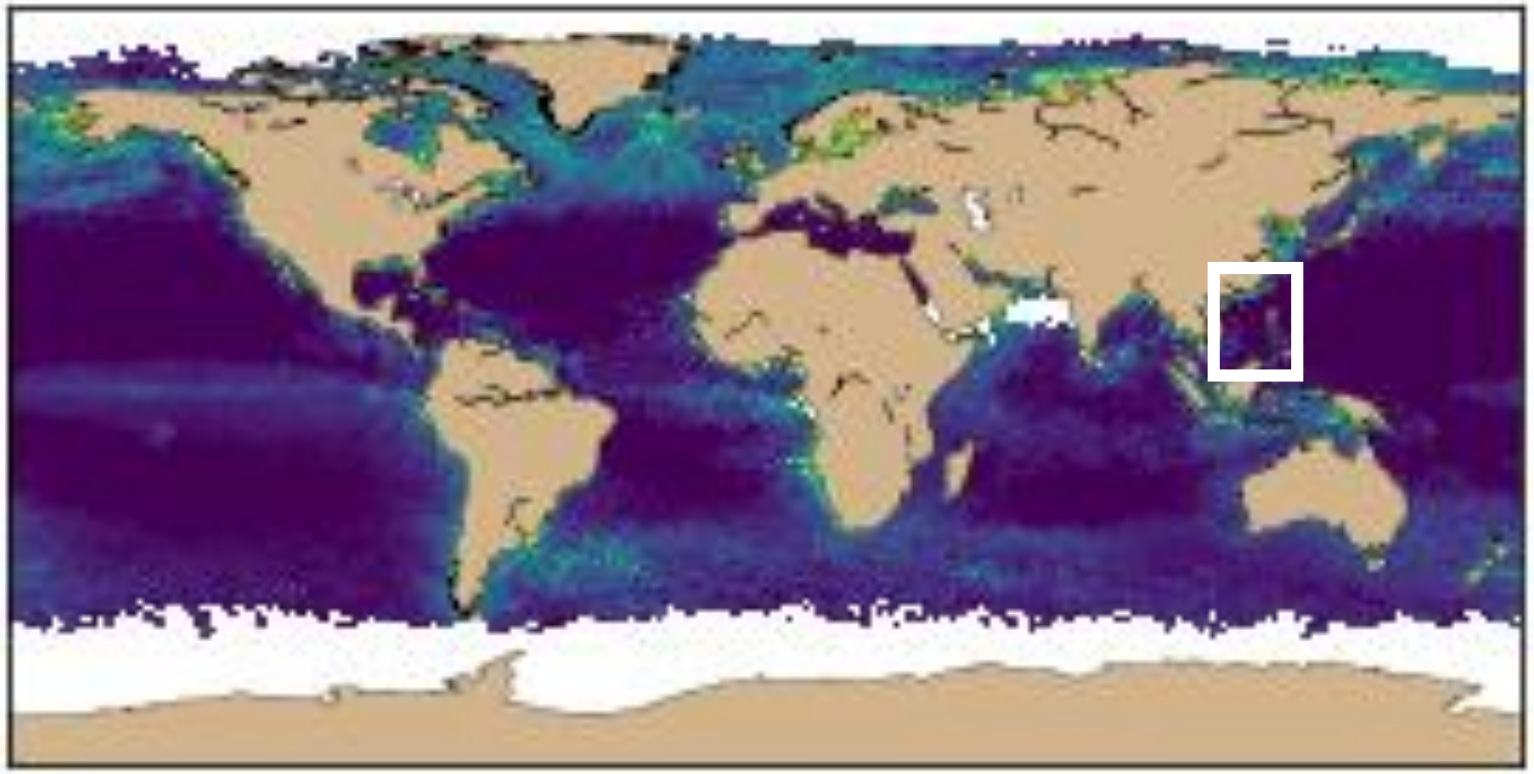
With all squares together, we create maps of where algae live

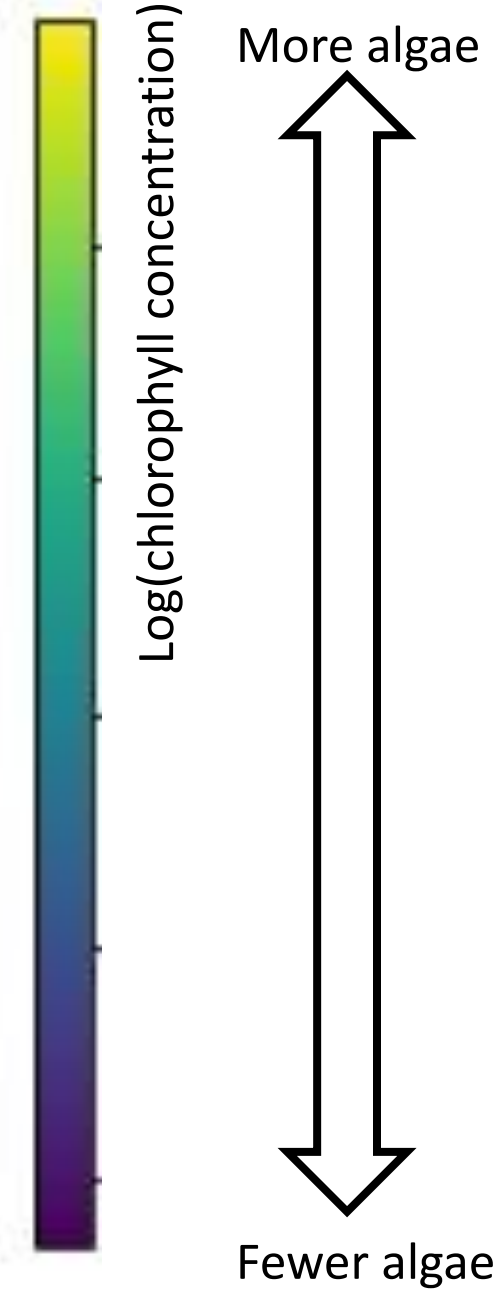




August 2017 (one year ago)

Now your turn



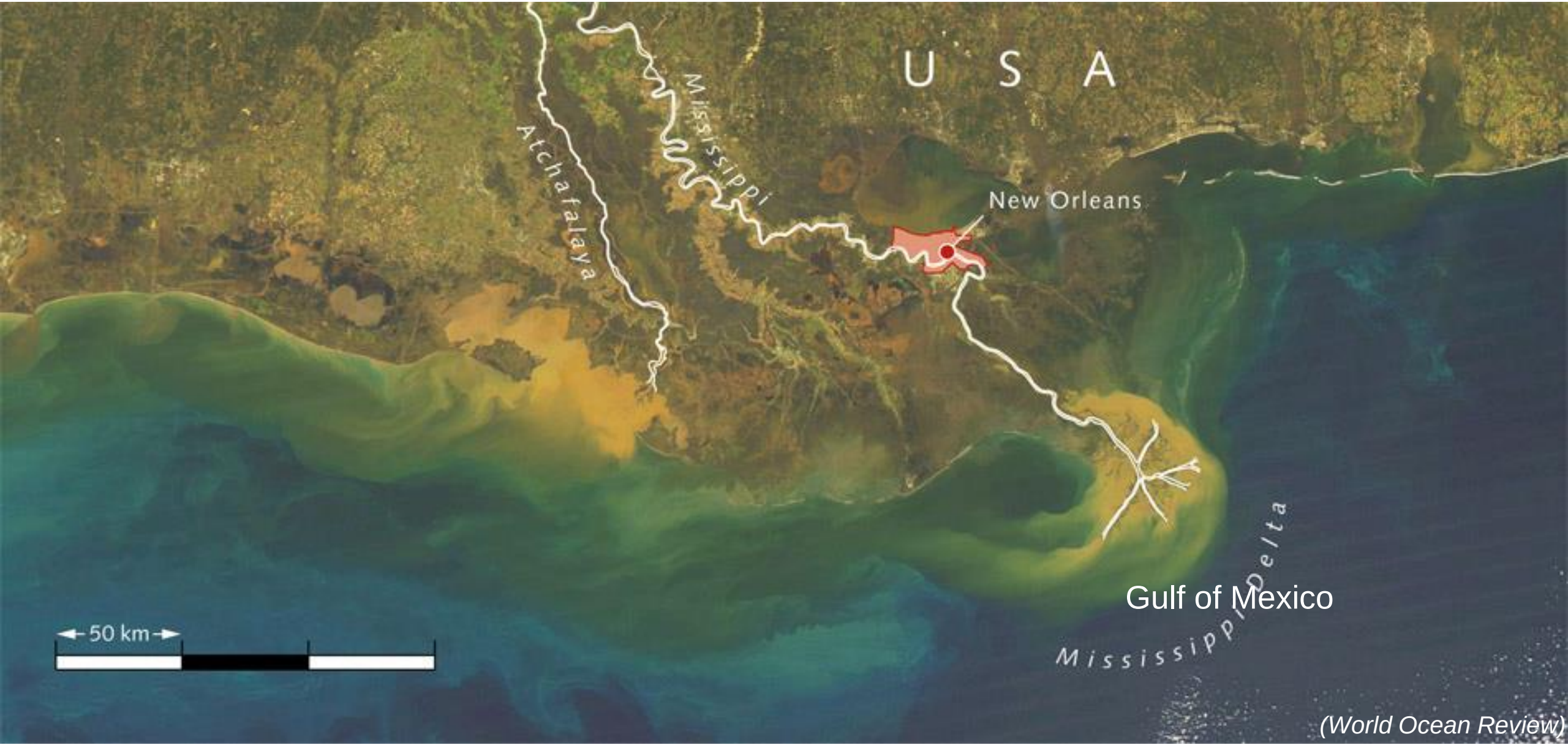


August 2017 (one year ago)

Pixlr (pixlr.com)

- Try at least 2-3 edits using the tools
- Think of why you are making your choices
- Example tools:
  - Adjustment
    - Brightness/Contrast
    - Hue/Saturation
      - Hue: Color change
      - Saturation: Intensity of color/no color
    - Lightness
  - Crop Tool - crops a photo to the size you want 
  - Wand Tool - auto-selects an area of a similar color 
  - Paint bucket - use to fill in a selected area with a solid color 

Mississippi River mouth



(World Ocean Review)


CHINA
VIETNAM
South China Sea
Yangtze
Guiyang
Kunming
Beipan
Nanpan
Hongshui
Long
Rong
Guilin
Liu
You
Liuzhou
Gui
He
Lian
Shaoguan
Qian
Wuzhou
Bei
Dong
Xi
Guangzhou
Yu
Xun
Yong
Zuo
Nanning
Zhaoqing
Huizhou
Jiangmen
Hong Kong
Macau
Zhu

(Kmusser)