

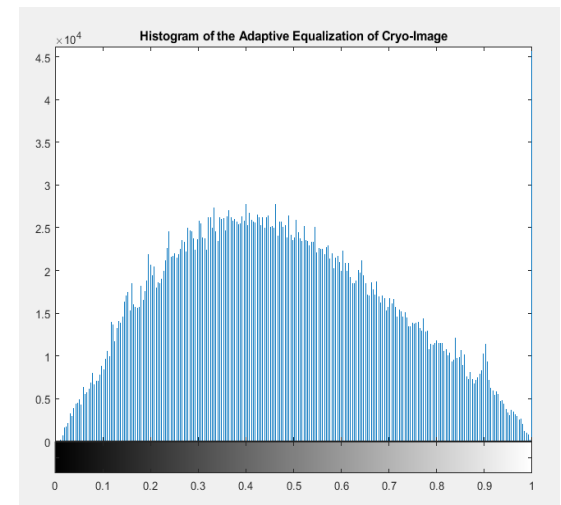
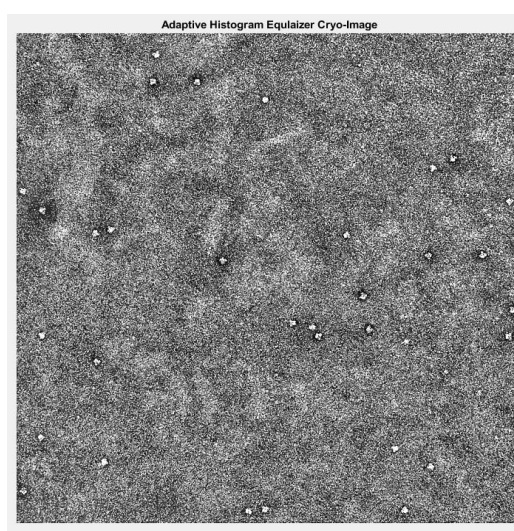
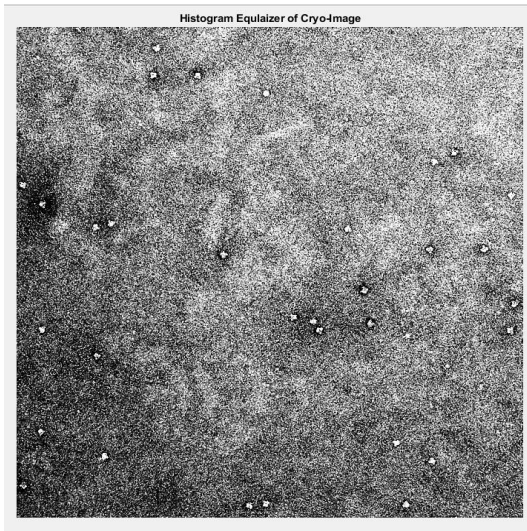
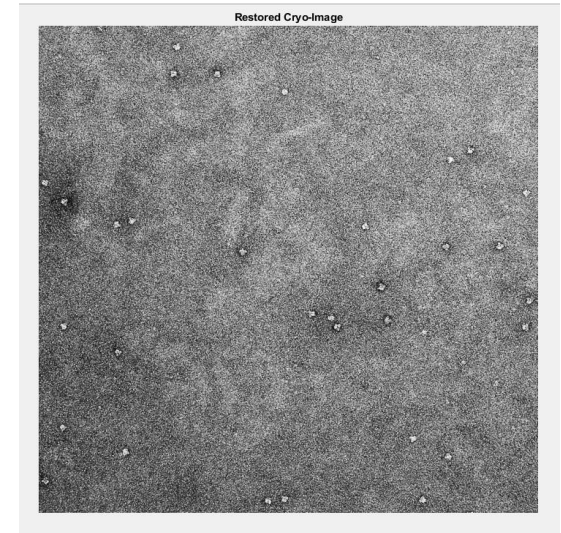
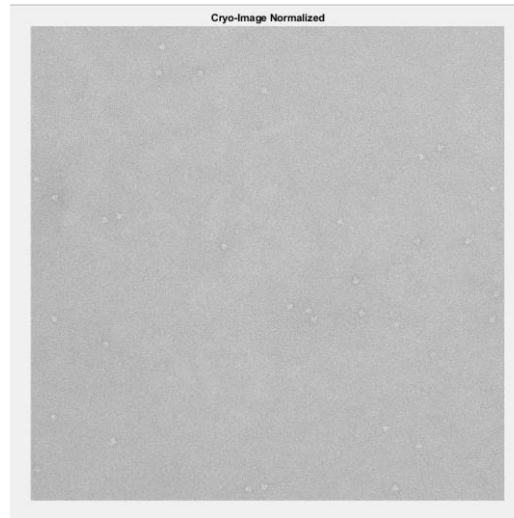


Cryo-Images Project

■ Cryo-image

■ First Dataset

- '*.hdf' images which is created by EMAN2
- '*.dm3' images which are created by GATAN



■ Load Cryo-image

■ BGal_000021.tif

Original Cryo-Image



originalImage								
3710x3838 uint32								
	1	2	3	4	5	6	7	8
1	1066792972	3222146975	3234469360	3234524342	3237166412	3230150401	3230676513	3235621050
2	1069382094	3204871494	3236983981	3234079374	3234740644	3235567004	3233138392	3217948916
3	3215457505	3229659211	3238239741	3233808097	3239000954	3240289970	3233067767	3225120319
4	319895532	3220185663	3227008908	3232589587	3240388189	3233516421	3235596988	3231716453
5	3221013468	3219542037	3224073513	3235520739	3236783492	3236341883	3238785096	3237063494
6	3186937461	3212966414	3235827117	3225463756	3233178384	3239071049	3231646753	3235801902
7	3218963049	1072593413	3231055308	3238928476	3233709850	3231794352	3239559737	3230406568
8	1070333784	3216011035	3232256533	3229284287	3234102202	3231094195	3224756829	3232076574
9	3202595123	3224284539	3218707942	3232067533	3236825982	3234462508	3239047437	3229858114
10	1067190814	1037089300	3218293402	3234588147	3226573907	3217187595	3231481449	3232325145
11	3197449088	3230883242	3232132898	3233790843	3238288058	3232791545	3231365217	3230078206
12	3202514417	3216115940	3212910682	3221816714	3236134771	3230941469	3231082983	3234148401
13	3213213811	3229264607	3234640832	3237927077	3231958711	3235519938	3239693382	3236397653
14	1068119631	3222213813	3223515364	3227640387	3236979745	3209913551	3233840969	3230700120
15	1066973675	3201683847	3209589916	3234975239	3236736025	3235937969	3230341128	3230750129
16	3221548089	1043533157	3230644847	3234390972	3231291576	3234346425	3237571806	3235501136
17	1066181648	3228906993	3232684300	3238006349	3234316338	3232795457	3227519323	3237865238
18	3214113459	3227608123	3227016639	3234067357	3239715765	3233948308	3230245068	3229746947
19	1062849570	1067073058	3232882455	3238876414	3239196430	3234069776	3230212058	3226820231
20	3213042690	1037127532	3217370801	3230967806	3234237117	3234808187	3234852858	3235606950
21	1036153932	3226318911	3229148331	3232294730	3233710642	3235051013	3228413081	3233454796
22	3223117576	3229940578	3221635707	3231885369	3230162454	3239096556	3234700906	3233544904

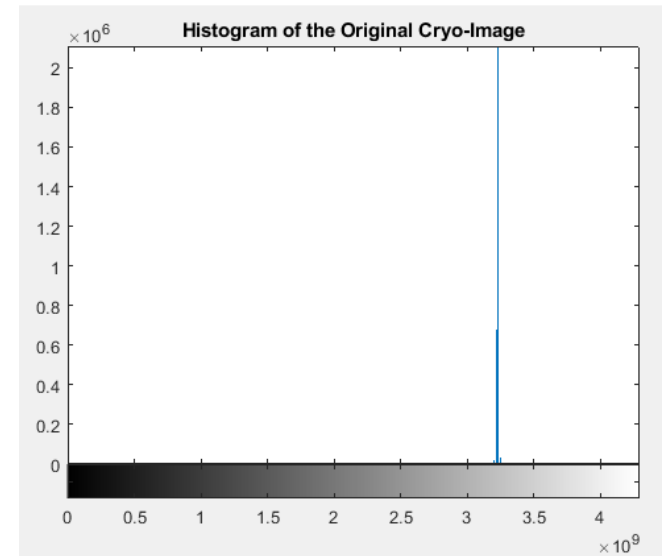
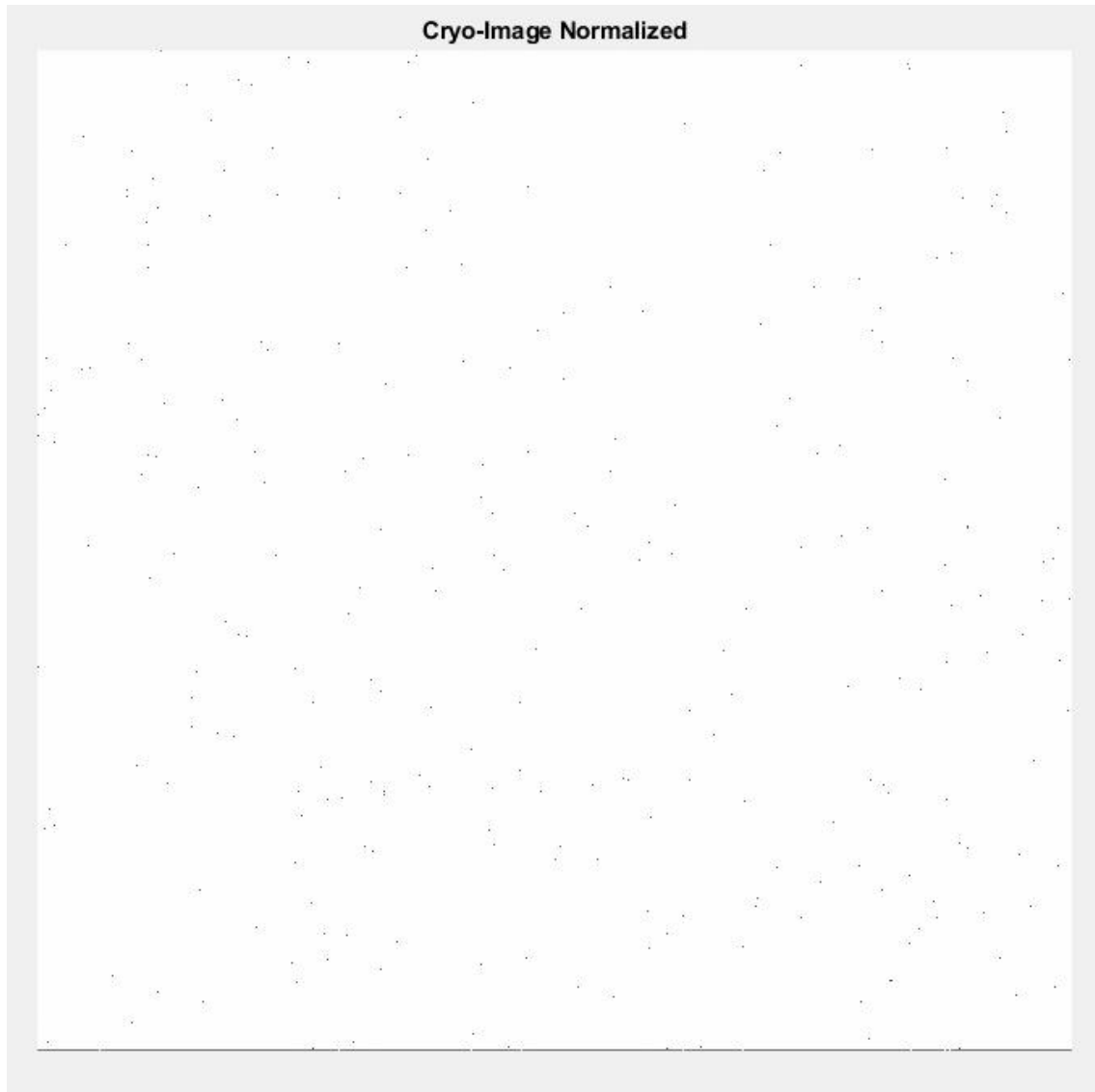


Image Normalization

ALDH7A1_NAD_UF_B5_0035.tif



Normalized								
3710x3838 double								
	1	2	3	4	5	6	7	8
1	0.3280	0.9908	0.9946	0.9946	0.9954	0.9932	0.9934	0.9949
2	0.3288	0.9855	0.9953	0.9944	0.9947	0.9949	0.9942	0.9895
3	0.9887	0.9931	0.9957	0.9944	0.9960	0.9964	0.9941	0.9917
4	0.9839	0.9902	0.9923	0.9940	0.9964	0.9943	0.9949	0.9937
5	0.9904	0.9900	0.9914	0.9949	0.9953	0.9951	0.9959	0.9954
6	0.9800	0.9880	0.9950	0.9918	0.9942	0.9960	0.9937	0.9950
7	0.9898	0.3298	0.9935	0.9959	0.9943	0.9937	0.9961	0.9933
8	0.3291	0.9889	0.9939	0.9930	0.9945	0.9935	0.9916	0.9938
9	0.9848	0.9914	0.9897	0.9938	0.9953	0.9946	0.9960	0.9931
10	0.3282	0.3189	0.9896	0.9946	0.9921	0.9893	0.9936	0.9939
11	0.9832	0.9935	0.9938	0.9944	0.9957	0.9941	0.9936	0.9932
12	0.9847	0.9889	0.9879	0.9907	0.9951	0.9935	0.9935	0.9945
13	0.9880	0.9930	0.9946	0.9956	0.9938	0.9949	0.9962	0.9952
14	0.3284	0.9908	0.9912	0.9925	0.9953	0.9870	0.9944	0.9934
15	0.3281	0.9845	0.9869	0.9947	0.9953	0.9950	0.9933	0.9934
16	0.9906	0.3209	0.9934	0.9945	0.9936	0.9945	0.9955	0.9949
17	0.3278	0.9929	0.9940	0.9957	0.9945	0.9941	0.9924	0.9956
18	0.9883	0.9925	0.9923	0.9944	0.9962	0.9944	0.9933	0.9931
19	0.3268	0.3281	0.9941	0.9959	0.9960	0.9944	0.9933	0.9922
20	0.9880	0.3189	0.9893	0.9935	0.9945	0.9947	0.9947	0.9949
21	0.3186	0.9921	0.9929	0.9939	0.9943	0.9947	0.9927	0.9943
22	0.9911	0.9932	0.9906	0.9938	0.9932	0.9960	0.9946	0.9943

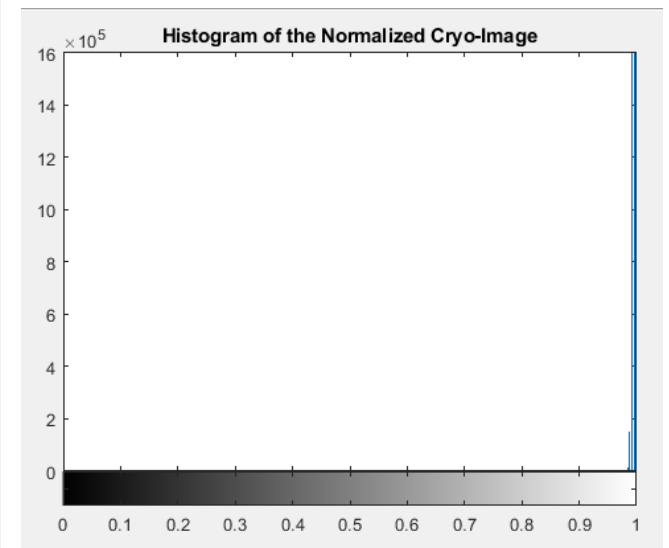
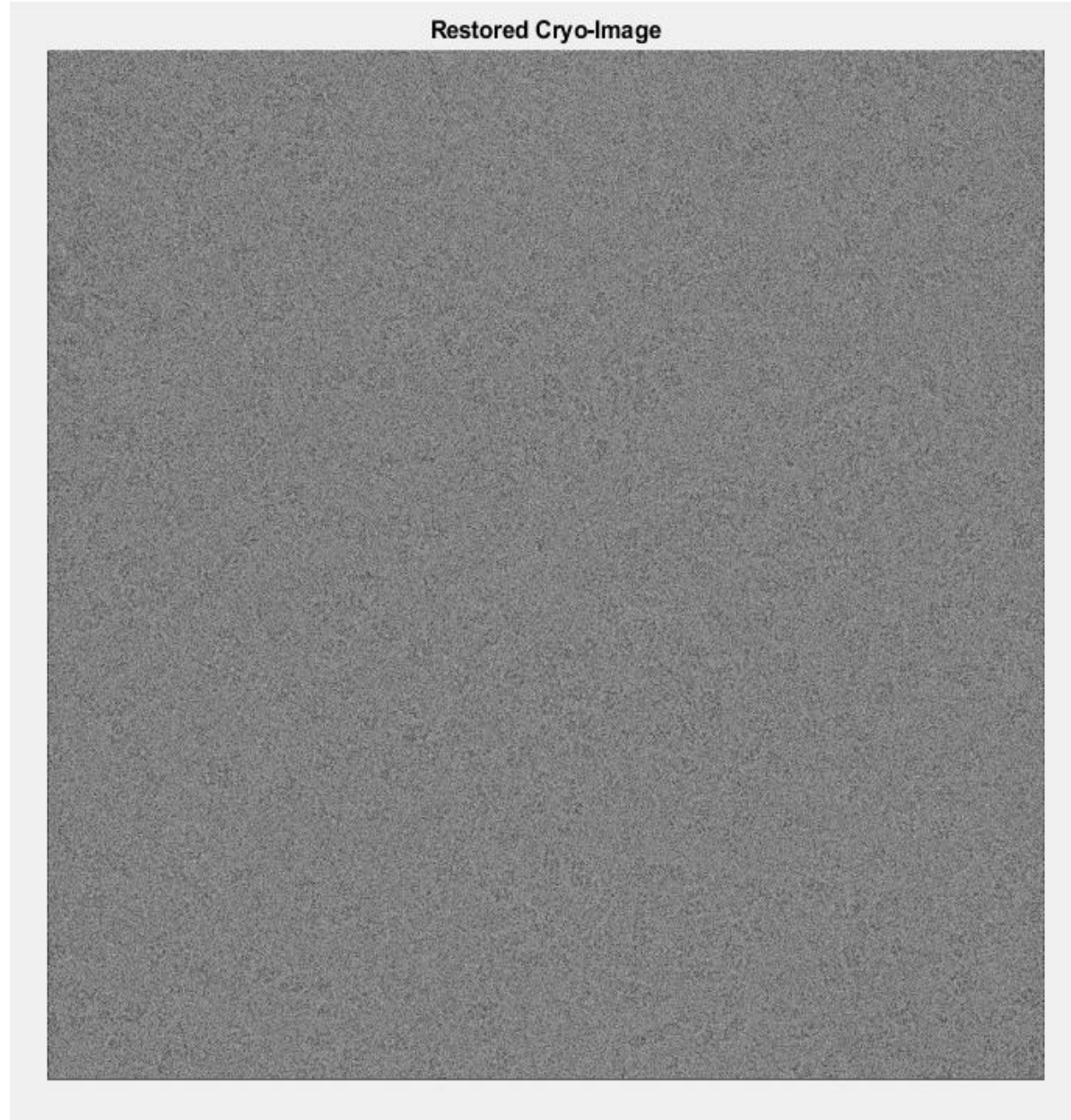
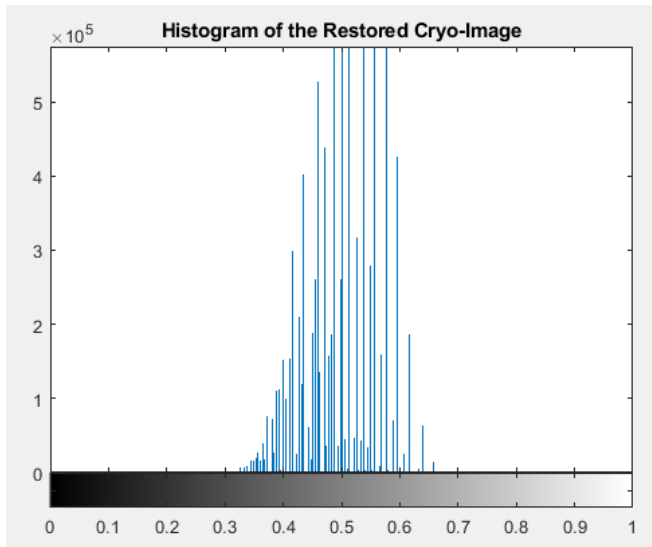
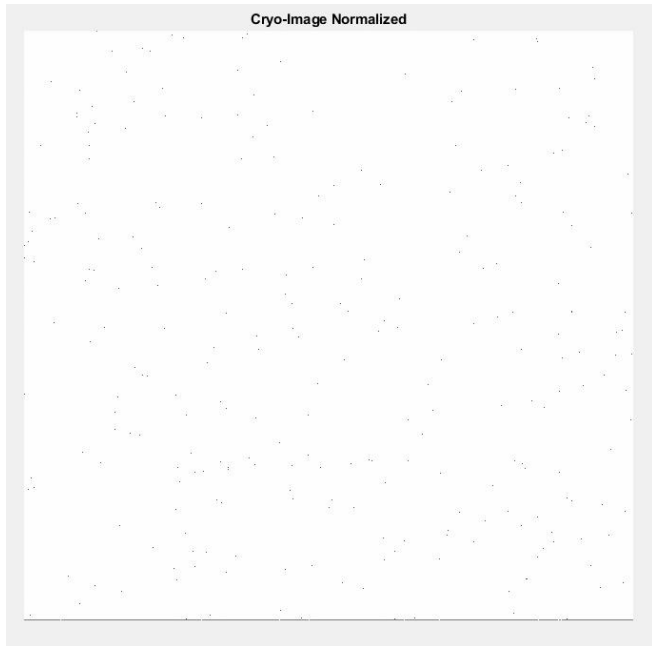


Image Restoration Using Wiener Filtering

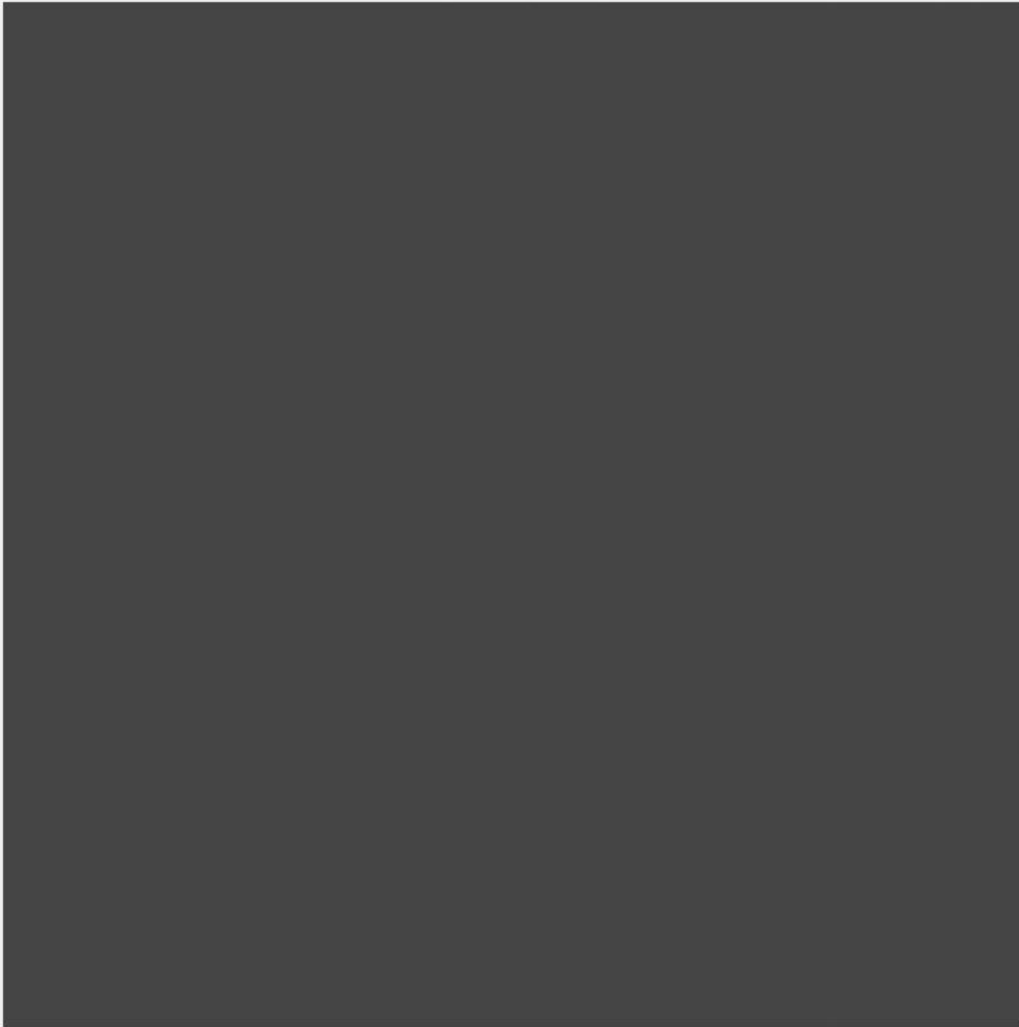


■ Cryo-image

■ Second Dataset

- '*.mrc' images which are created by RELION

Original Cryo-Image



originalImage x							
2048x2048 uint32							
	1	2	3	4	5	6	7
1	1172402176	1172146176	1171810304	1171886080	1171793920	1171599360	1171163136
2	1171333120	1171488768	1170757632	1171224576	1171357696	1170372608	1169870848
3	1171034112	1170903040	1170733056	1170411520	1170421760	1170061312	1169862656
4	1171349504	1171175424	1170741248	1171183616	1171740672	1171308544	1170855936
5	1170976768	1170927616	1170825216	1170542592	1171580928	1170935808	1171576832
6	1171066880	1171181568	1171978240	1170610176	1171062784	1171183616	1171935232
7	1170860032	1171453952	1171707904	1170814976	1171488768	1172281344	1172144128
8	1171120128	1171806208	1171038208	1171120128	1171048448	1172164608	1172885504
9	1172074496	1171761152	1170618368	1170946048	1171030016	1171232768	1172295680
10	1171417088	1170900992	1170073600	1169729536	1170198528	1171458048	1171855360
11	1170882560	1170317312	1170798592	1170255872	1170626560	1171757056	1172922368
12	1171230720	1170640896	1171456000	1171771392	1171191808	1171697664	1172238336
13	1172531200	1171709952	1172068352	1172520960	1171884032	1171441664	1172258816
14	1173710848	1172578304	1171716096	1172408320	1172994048	1172027392	1172232192
15	1172938752	1172940800	1172221952	1172539392	1173377024	1172477952	1172459520
16	1171363840	1172848640	1173084160	1172992000	1173551104	1173774336	1173325824
17	1173082112	1174132736	1174188032	1174136832	1173749760	1174608896	1173379072
18	1174612992	1174895616	1174685696	1174269952	1173334016	1172944896	1172877312
19	1174185984	1174481920	1174095872	1173489664	1172647936	1171611648	1171292160
20	1173010432	1173788672	1173114880	1172154368	1172406272	1172310016	1171394560
21	1171865600	1171519488	1172357120	1171800064	1172066304	1172271104	1171732480
22	1171625984	1170569216	1171271680	1171357696	1171802112	1172420608	1172361216

Histogram of the Original Cryo-Image

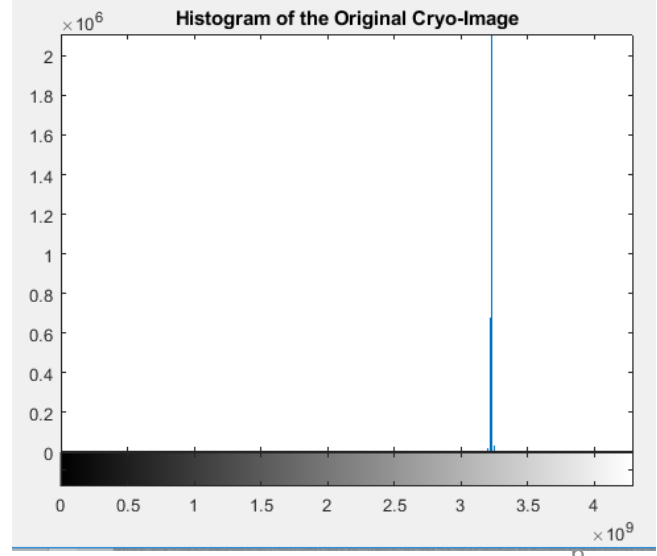


Image Normalization

- ALDH7A1_NAD_UF_B5_0035.tif

Cryo-Image Normalized

Normalized								
2048x2048 double								
	1	2	3	4	5	6	7	8
1	0.9956	0.9953	0.9951	0.9951	0.9950	0.9949	0.9945	0.9955
2	0.9947	0.9948	0.9942	0.9946	0.9947	0.9938	0.9934	0.9941
3	0.9944	0.9943	0.9941	0.9939	0.9939	0.9936	0.9934	0.9929
4	0.9947	0.9945	0.9942	0.9945	0.9950	0.9946	0.9943	0.9933
5	0.9944	0.9943	0.9942	0.9940	0.9949	0.9943	0.9949	0.9937
6	0.9944	0.9945	0.9952	0.9940	0.9944	0.9945	0.9952	0.9947
7	0.9943	0.9948	0.9950	0.9942	0.9948	0.9955	0.9953	0.9952
8	0.9945	0.9951	0.9944	0.9945	0.9944	0.9954	0.9960	0.9955
9	0.9953	0.9950	0.9940	0.9943	0.9944	0.9946	0.9955	0.9950
10	0.9947	0.9943	0.9936	0.9933	0.9937	0.9948	0.9951	0.9955
11	0.9943	0.9938	0.9942	0.9937	0.9941	0.9950	0.9960	0.9972
12	0.9946	0.9941	0.9948	0.9950	0.9945	0.9950	0.9954	0.9958
13	0.9957	0.9950	0.9953	0.9957	0.9951	0.9947	0.9954	0.9946
14	0.9967	0.9957	0.9950	0.9956	0.9961	0.9952	0.9954	0.9960
15	0.9960	0.9960	0.9954	0.9957	0.9964	0.9956	0.9956	0.9962
16	0.9947	0.9959	0.9961	0.9961	0.9965	0.9967	0.9963	0.9961
17	0.9961	0.9970	0.9971	0.9970	0.9967	0.9974	0.9964	0.9951
18	0.9974	0.9977	0.9975	0.9971	0.9964	0.9960	0.9960	0.9959
19	0.9971	0.9973	0.9970	0.9965	0.9958	0.9949	0.9946	0.9958
20	0.9961	0.9967	0.9962	0.9954	0.9956	0.9955	0.9947	0.9946
21	0.9951	0.9948	0.9955	0.9951	0.9953	0.9955	0.9950	0.9941
22	0.9949	0.9940	0.9946	0.9947	0.9951	0.9956	0.9955	0.9948

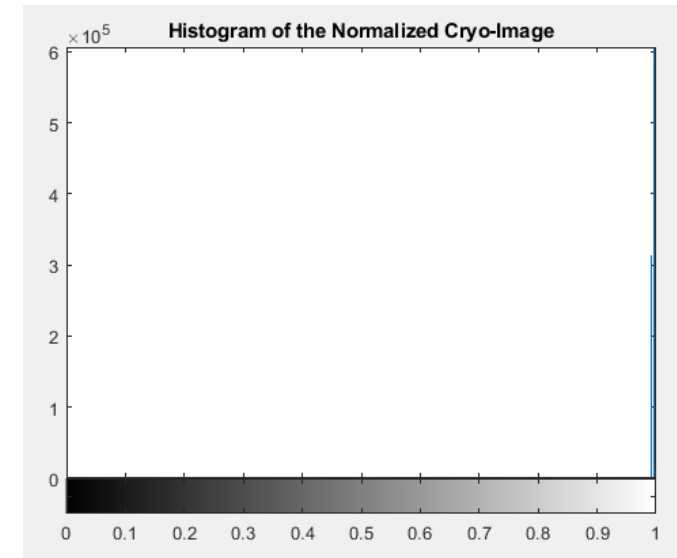
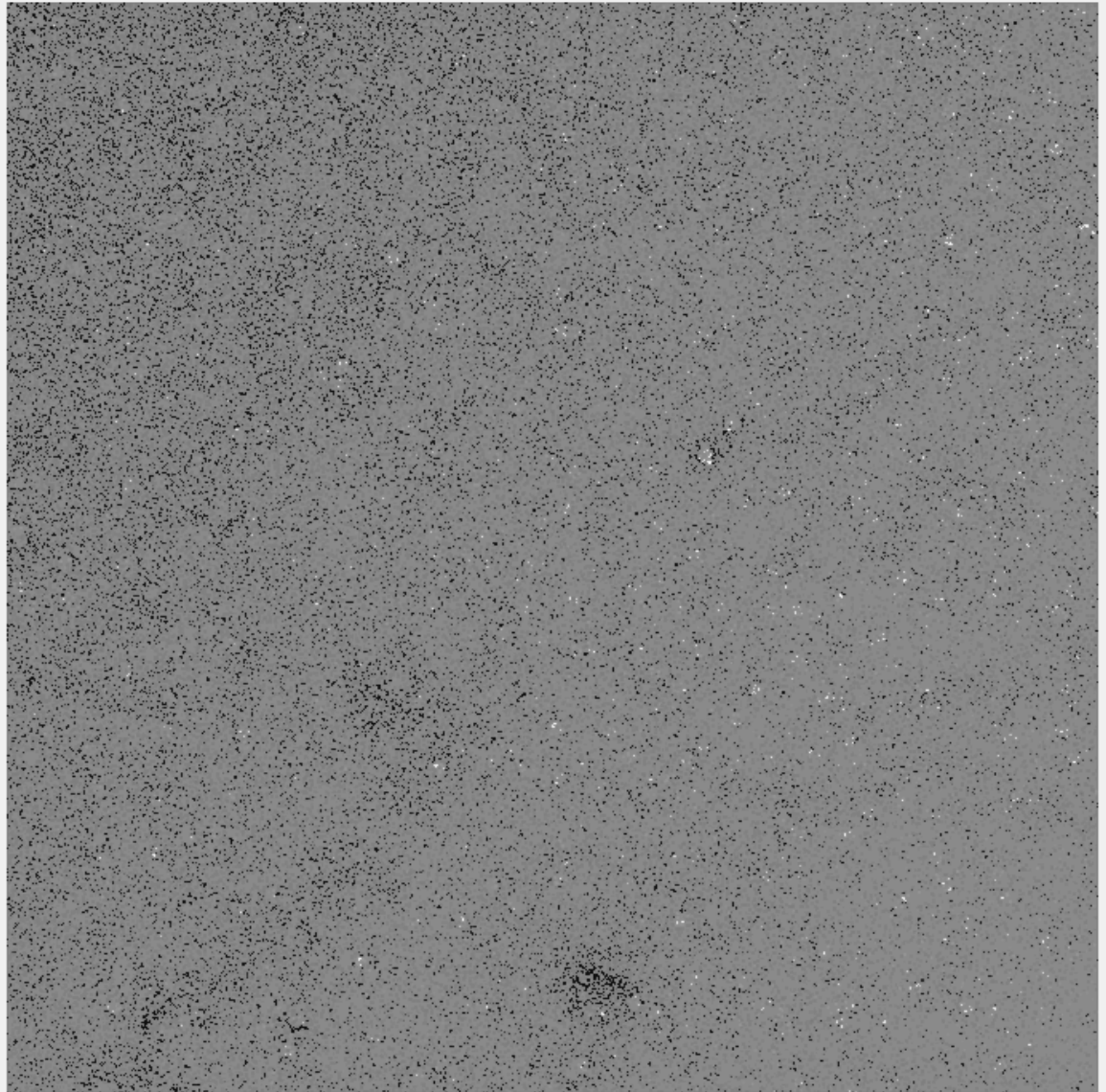


Image Restoration Using Wiener Filtering

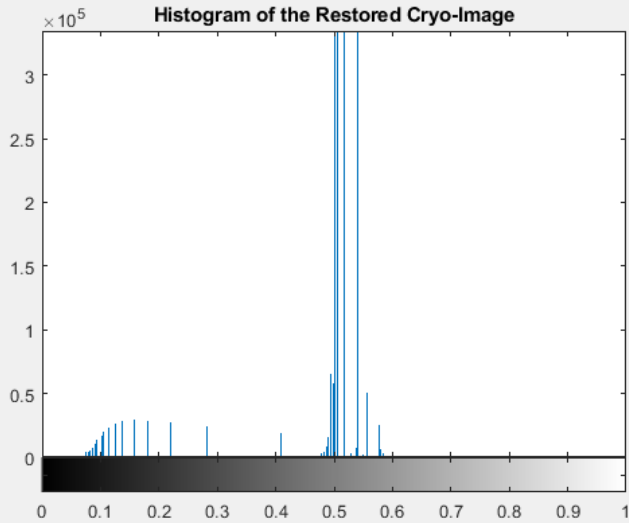
Cryo-Image Normalized



Restored Cryo-Image

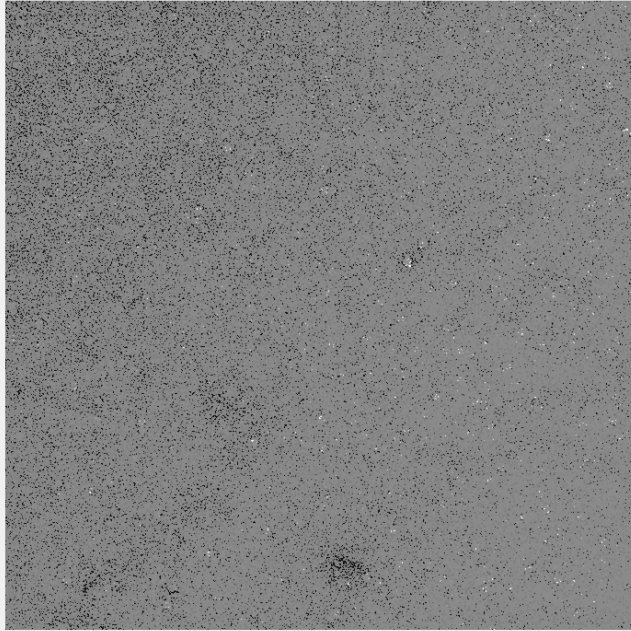


Histogram of the Restored Cryo-Image

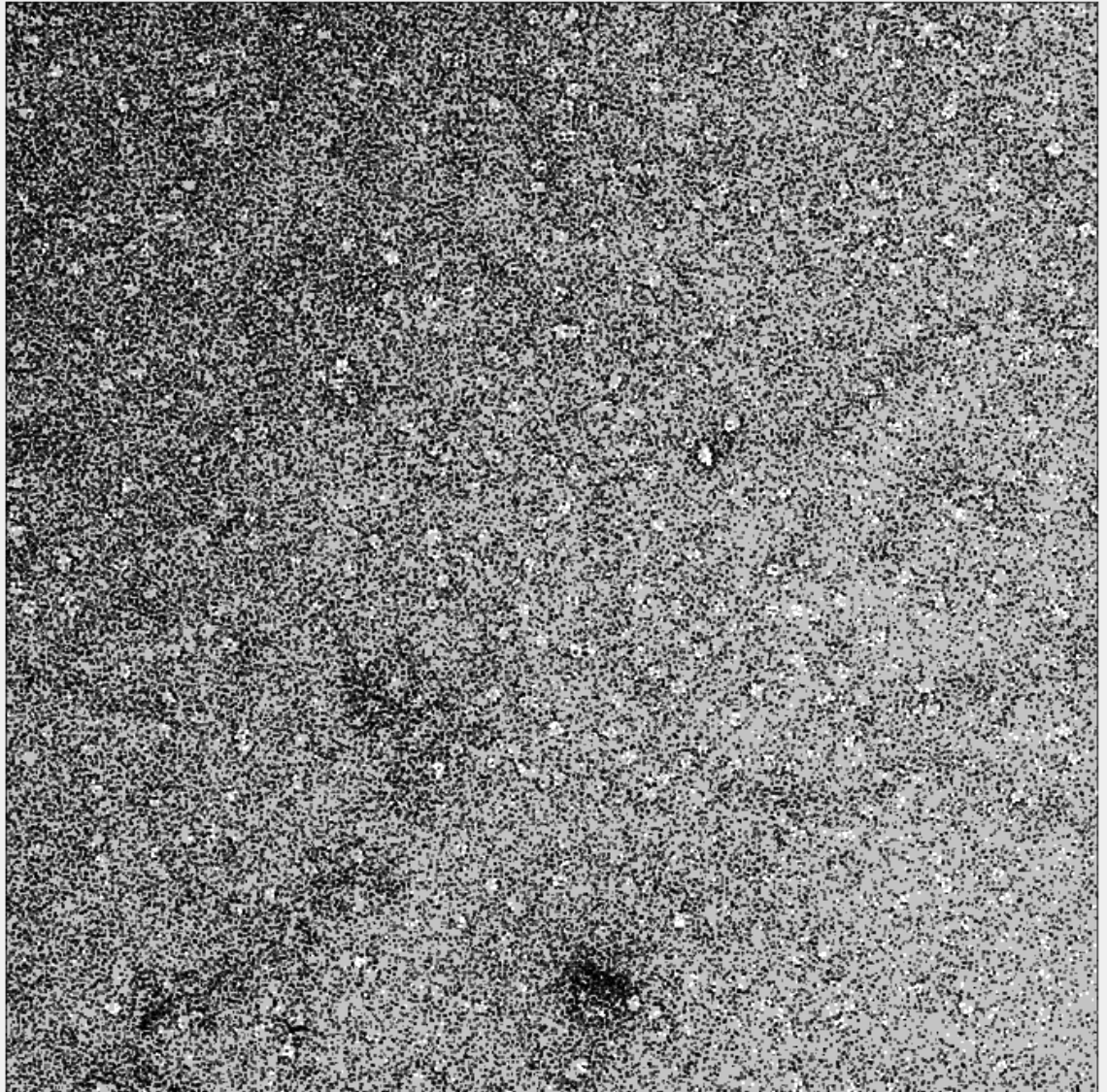


■ Histogram Equalization

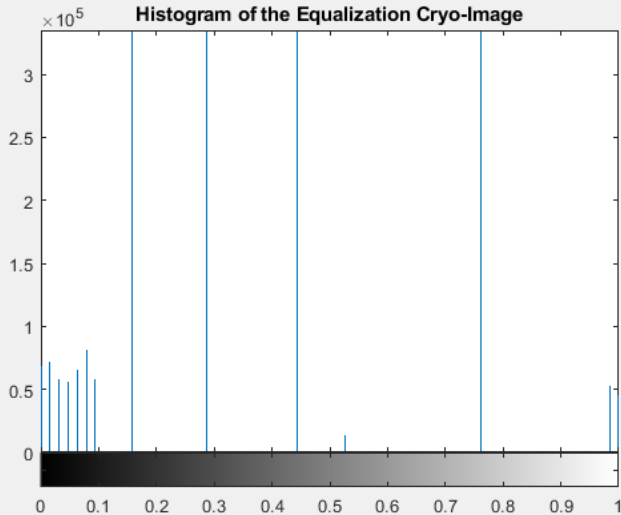
Restored Cryo-Image



Histogram Equalizer of Cryo-Image

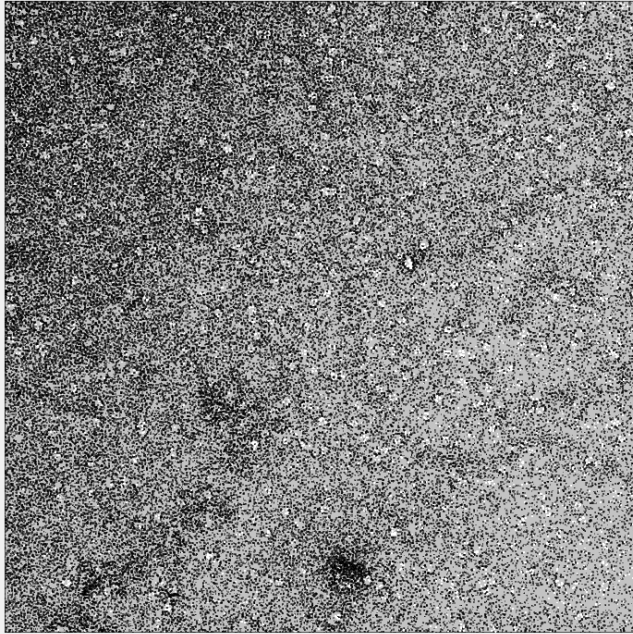


Histogram of the Equalization Cryo-Image

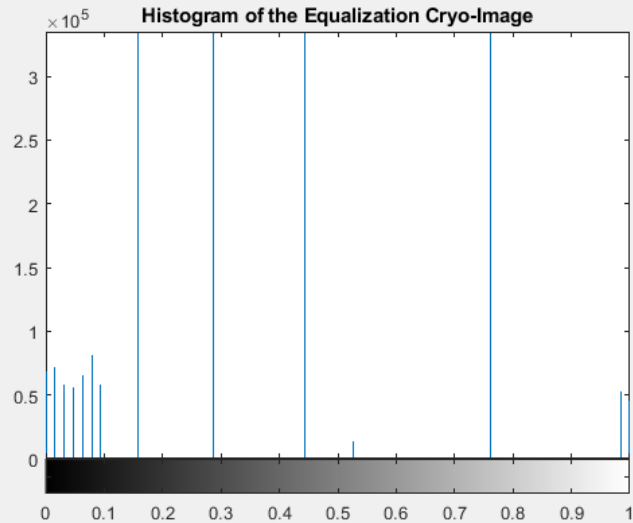


▪ Adaptive Histogram Equalization

Histogram Equalizer of Cryo-Image



Histogram of the Equalization Cryo-Image



Adaptive Histogram Equalizer Cryo-Image

