

Methods *Advantages & Disadvantages*

	Methods	Advantages	Disadvantages		Methods	Advantages	Disadvantages
Mean Brightness Preserving Histogram Equalization (MBPHE)	BBHE	Simple to implement, and can maintain brightness to some extent.	There are obvious deficiencies in the accuracy and stability of image brightness maintenance.	Local Histogram Equalization (LHE)	CLAHE	Smoother histogram. Details are preserved. The problem of amplifying noise is solved.	Focus on optimizing the contract. The output image is very different from the original one.
	QBHE	Simple to implement, and can maintain brightness to some extent.	The association information between pixels is ignored.		POSHE	Keep a good enhancement ability while reducing the computational complexity.	Inevitable blocking effect.
	DSIHE	Simple to implement. Maximum Shannon Entropy is provided.	Does not enhance contrast very effectively.		AHE	Improve the local contrast. Get more details.	Magnify image noise.
	MMBEBHE	Provide clear results with good brightness preservation and contrast enhancement.	There are many iterations so that the time complexity is high.		BPDHE	Considering the distribution of the original histogram, the appropriate region is selected according to the distribution.	High computational complexity.
	RMSHE	Provide smoother brightness preservation results.	Recursive procedure increases the time complexity. When the recursion parameter γ are large enough, the effect of image enhancement will degrade seriously.	Clipping- Based Histogram Equalization (CBHE)	WTHE	Excessive contrast enhancement can be avoided.	The automation of this algorithm is low and the procedure is not intuitive.
	RSIHE	Provide smoother brightness preservation results.			BUBOHE	Excessive contrast enhancement can be avoided.	It's difficult to find an optimal hyper-parameters.
	RSWHE	Provide smoother brightness preservation results. Image features can be preserved while enhancing contrast	The association information between pixels is ignored.		AMHE	Excessive contrast enhancement can be avoided.	High computational complexity.
					ESIHE	Excessive contrast enhancement can be avoided.	It's difficult to find an optimal hyper-parameters.

References *Paper links*

	Methods	Links		Methods	Links	
Mean Brightness Preserving Histogram Equalization (MBPHE)	BBHE	https://ieeexplore.ieee.org/abstract/document/580378	Local Histogram Equalization (LHE)	CLAHE	https://link.springer.com/article/10.1007%2FBF03178082	
	QBHE	https://ieeexplore.ieee.org/abstract/document/595370		POSHE	https://ieeexplore.ieee.org/abstract/document/915354 https://www.sciencedirect.com/science/article/pii/S135044951730155X?casa_token=eJUkMwf3--OAAAAA:3965n7vmwv26y1HQV1xohdwZ9nGvjTTVRdGaSiv_WBvrBYld0szxz7fAVmOqw-ha0mHbVdgbpQ https://ieeexplore.ieee.org/abstract/document/1706495	
	DSIHE	https://ieeexplore.ieee.org/abstract/document/754419			AHE	https://www.sciencedirect.com/science/article/abs/pii/S0734189X8780186X
	MMBEBHE	https://ieeexplore.ieee.org/abstract/document/1261234			BPDHE	https://ieeexplore.ieee.org/abstract/document/4266947 https://ieeexplore.ieee.org/abstract/document/4429280
	RMSHE	https://ieeexplore.ieee.org/abstract/document/1261233		WTHE	https://ieeexplore.ieee.org/abstract/document/4429280 https://ieeexplore.ieee.org/abstract/document/5722541	
	RSIHE	https://www.sciencedirect.com/science/article/pii/S0167865507000578?casa_token=7TmXPEj-l6sAAAAA:mcGaEP_1ZJtVDNKsGZ6uQWjtEg-6Dyh58pjs2wyENTQhwGPcZ6zge0SC8lltS_2fps44WyxMbp8	Clipping- Based Histogram Equalization (CBHE)	BUBOHE	https://ieeexplore.ieee.org/abstract/document/1247104	
	RSWHE	https://ieeexplore.ieee.org/abstract/document/4637632		AMHE	https://link.springer.com/chapter/10.1007/11949534_116	
				ESIHE	https://www.sciencedirect.com/science/article/pii/S0030402614006111?casa_token=FfZntslCMfsAAAAA:3M8PQm2aM0vMwZP9nu5s4VyJuC_3m2Atj0ThpjgEmMJbsRttsO6saNxpXjn-ujqfc8IDGiK2lq0 https://www.sciencedirect.com/science/article/pii/S0167865513003280?casa_token=97Vgv4Q2HQAaaaaa:WvcPyKWYeOleFK1fBISNUJ4R-NvAhvZpHHCGjtTHt0kBoJqxMazUdnv0PnoSeag-wXOrukMBXL4	

PSNR *Peak Signal-to-Noise Ratio*

	Methods														
	Mean Brightness Preserving Histogram Equalization							Local Histogram Equalization				Clipping-Based Histogram Equalization			
Image	BBHE	QBHE	DSIHE	MMBEBHE	RMSHE	RSIHE	RSWHE	CLAHE	POSHE	AHE	BPDHE	WTHE	BUBOHE	AMHE	ESIHE
Photographer	17.92	15.28	18.11	21.02	20.43	21.04	32.98	19.27	12.22	13.64	22.84	18.33	18.64	26.34	19.08
House	19.40	17.28	18.55	22.53	23.03	23.54	35.62	19.67	13.89	13.76	22.89	17.23	10.52	26.89	19.67
Green Pepper	20.58	18.16	20.56	20.27	25.03	24.87	30.12	18.82	18.01	18.10	28.51	21.04	20.59	29.63	22.58
Starfish	26.80	19.17	26.70	26.94	40.47	41.54	50.27	16.31	15.33	15.74	37.33	27.98	23.06	33.35	20.29
Butterfly	24.63	19.28	23.76	25.68	29.85	29.33	36.78	16.46	15.61	15.07	23.95	20.82	17.95	28.97	25.97
Plane	24.19	18.93	15.74	23.64	28.25	26.34	36.88	17.28	11.42	11.74	20.53	17.80	13.25	19.10	12.27
Parrot	20.80	17.88	20.54	26.63	29.86	28.87	41.25	18.15	14.37	15.31	30.58	25.15	20.91	35.83	29.67
Woman	20.87	17.20	20.84	25.96	28.71	28.02	34.19	18.25	16.94	17.23	27.72	20.67	18.66	28.54	24.64
Sitting Woman	23.04	18.37	23.04	23.47	30.03	29.24	36.77	17.48	16.98	17.34	28.15	23.14	19.88	30.82	26.36
Ship	16.77	14.18	16.07	17.28	22.67	23.13	33.67	16.23	14.26	14.72	18.63	17.34	17.08	24.84	21.58
Man	20.45	17.33	20.45	22.92	25.01	25.00	33.68	17.91	16.45	16.37	16.29	19.29	16.60	31.01	23.07
Room	16.79	14.32	16.87	16.88	23.43	22.91	32.31	17.36	16.14	16.25	17.54	19.04	16.47	30.47	24.29

MSE

Mean Absolute Error

	Methods														
	Mean Brightness Preserving Histogram Equalization							Local Histogram Equalization				Clipping-Based Histogram Equalization			
Image	BBHE	QBHE	DSIHE	MMBE BHE	RMSHE	RSIHE	RSWHE	CLAHE	POSHE	AHE	BPDHE	WTHE	BUBOHE	AMHE	ESIHE
Photographer	1049.97	1928.40	1033.74	514.57	589.60	512.51	32.74	769.11	3899.12	2813.89	338.48	954.66	888.75	150.87	804.33
House	747.07	1215.36	907.60	363.26	324.12	288.08	17.84	701.90	2656.69	2735.42	333.88	1229.68	5767.13	132.94	701.06
Green Pepper	568.74	992.30	571.45	611.73	204.17	211.76	63.27	852.67	1029.00	1008.20	91.54	511.99	568.60	70.84	359.20
Starfish	135.93	787.85	139.15	131.47	5.83	4.55	0.61	1522.06	1905.28	1734.11	12.01	103.48	321.14	30.05	607.89
Butterfly	223.88	767.29	273.74	175.72	67.29	75.88	13.65	1469.85	1786.52	1748.44	261.89	538.14	1042.55	82.42	164.65
Plane	247.81	832.26	1735.23	281.17	97.37	151.21	13.34	1217.05	4689.18	4358.46	575.31	1078.44	3047.97	799.92	3859.52
Parrot	540.74	1058.33	574.51	141.08	67.14	84.30	4.88	996.56	2377.64	1916.27	56.89	198.42	527.34	16.70	70.10
Woman	532.54	1240.22	535.97	164.88	87.60	102.57	24.78	973.62	1315.07	1230.87	109.85	557.45	885.50	90.95	223.17
Sitting Woman	322.65	945.73	322.65	292.20	64.51	77.48	13.69	1162.72	1302.61	1199.44	99.61	315.31	668.26	53.80	150.32
Ship	1369.55	2484.59	1605.91	1217.29	352.02	316.39	27.91	1548.84	2437.25	2192.42	890.91	1198.88	1274.87	213.47	452.05
Man	586.39	1203.54	587.62	331.60	205.00	205.54	27.89	1052.02	1473.31	1501.14	1528.77	766.38	1421.40	51.48	321.00
Room	1363.24	2405.85	1336.75	1334.32	295.23	333.01	38.18	1194.74	1580.90	1541.42	1146.15	811.64	1466.01	58.42	242.13

AMBE Absolute Mean Brightness Error

	Methods														
	Mean Brightness Preserving Histogram Equalization							Local Histogram Equalization				Clipping-Based Histogram Equalization			
Image	BBHE	QBHE	DSIHE	MMBEBHE	RMSHE	RSIHE	RSWHE	CLAHE	POSHE	AHE	BPDHE	WTHE	BUBOHE	AMHE	ESIHE
Photographer	24.17	25.16	18.28	0.03	12.77	9.34	1.99	6.09	5.53	10.97	7.60	0.001	13.34	8.96	16.68
House	12.69	8.59	11.76	0.11	4.33	1.42	0.45	5.63	10.15	4.81	11.07	0.20	6.71	10.49	10.50
Green Pepper	1.53	2.07	1.37	0.17	4.51	3.74	2.44	3.71	4.43	5.43	5.94	0.02	7.53	4.02	5.49
Starfish	0.17	4.51	1.07	0.02	1.00	0.68	0.16	0.24	0.86	3.46	0.34	0.02	10.00	1.43	5.16
Butterfly	0.17	2.46	2.54	0.0006	0.72	1.86	0.49	16.33	15.94	16.36	9.51	0.55	22.52	5.00	2.28
Plane	5.72	5.63	21.28	5.51	2.17	5.37	1.29	22.71	49.35	47.43	4.88	4.69	38.46	26.77	23.84
Parrot	16.94	17.22	16.11	0.06	2.54	3.52	0.87	15.65	26.34	18.42	4.82	0.48	18.24	2.74	3.55
Woman	9.76	7.88	7.20	0.13	2.95	3.73	1.45	4.50	5.25	4.78	8.20	0.06	12.86	2.17	5.96
Sitting Woman	5.69	2.30	5.69	0.01	1.45	2.18	0.31	10.23	8.94	10.77	7.99	0.10	16.68	1.29	2.91
Ship	19.98	18.40	2.33	0.01	6.54	5.93	1.26	1.10	3.78	1.13	10.00	0.0006	1.76	12.78	13.36
Man	17.34	15.92	16.97	1.56	7.16	7.58	2.67	10.49	11.82	17.16	35.79	0.44	26.92	0.58	6.06
Room	9.77	4.35	4.07	0.05	5.51	5.19	2.11	6.78	5.65	7.90	7.81	0.19	15.31	0.49	3.54

SSIM

Structure Similarity

	Methods														
	Mean Brightness Preserving Histogram Equalization							Local Histogram Equalization				Clipping-Based Histogram Equalization			
Image	BBHE	QBHE	DSIHE	MMBEBHE	RMSHE	RSIHE	RSWHE	CLAHE	POSHE	AHE	BPDHE	WTHE	BUBOHE	AMHE	ESIHE
Photographer	0.77	0.57	0.75	0.83	0.88	0.82	0.98	0.69	0.41	0.47	0.90	0.80	0.80	0.98	0.90
House	0.61	0.48	0.53	0.70	0.82	0.77	0.98	0.70	0.39	0.39	0.76	0.54	0.25	0.97	0.88
Green Pepper	0.85	0.72	0.85	0.82	0.95	0.94	0.98	0.79	0.70	0.75	0.97	0.89	0.90	0.99	0.95
Starfish	0.92	0.77	0.93	0.92	1.00	1.00	1.00	0.79	0.74	0.77	0.99	0.95	0.95	0.99	0.89
Butterfly	0.90	0.76	0.89	0.92	0.97	0.97	1.00	0.78	0.70	0.73	0.95	0.86	0.90	0.99	0.97
Plane	0.91	0.75	0.64	0.90	0.96	0.94	0.99	0.71	0.47	0.49	0.78	0.71	0.60	0.93	0.68
Parrot	0.88	0.72	0.86	0.93	0.97	0.97	1.00	0.77	0.62	0.67	0.96	0.91	0.91	0.99	0.98
Woman	0.86	0.71	0.85	0.95	0.97	0.97	0.99	0.76	0.67	0.71	0.97	0.88	0.89	0.98	0.97
Sitting Woman	0.90	0.75	0.99	0.89	0.98	0.97	0.99	0.83	0.77	0.82	0.98	0.89	0.93	0.99	0.96
Ship	0.72	0.57	0.60	0.68	0.87	0.88	0.98	0.66	0.57	0.59	0.73	0.68	0.68	0.95	0.91
Man	0.88	0.69	0.87	0.87	0.94	0.94	0.99	0.77	0.69	0.72	0.91	0.80	0.87	0.98	0.91
Room	0.71	0.57	0.69	0.67	0.92	0.92	0.99	0.75	0.69	0.70	0.78	0.79	0.78	0.98	0.94

Fig.1 *photographer*

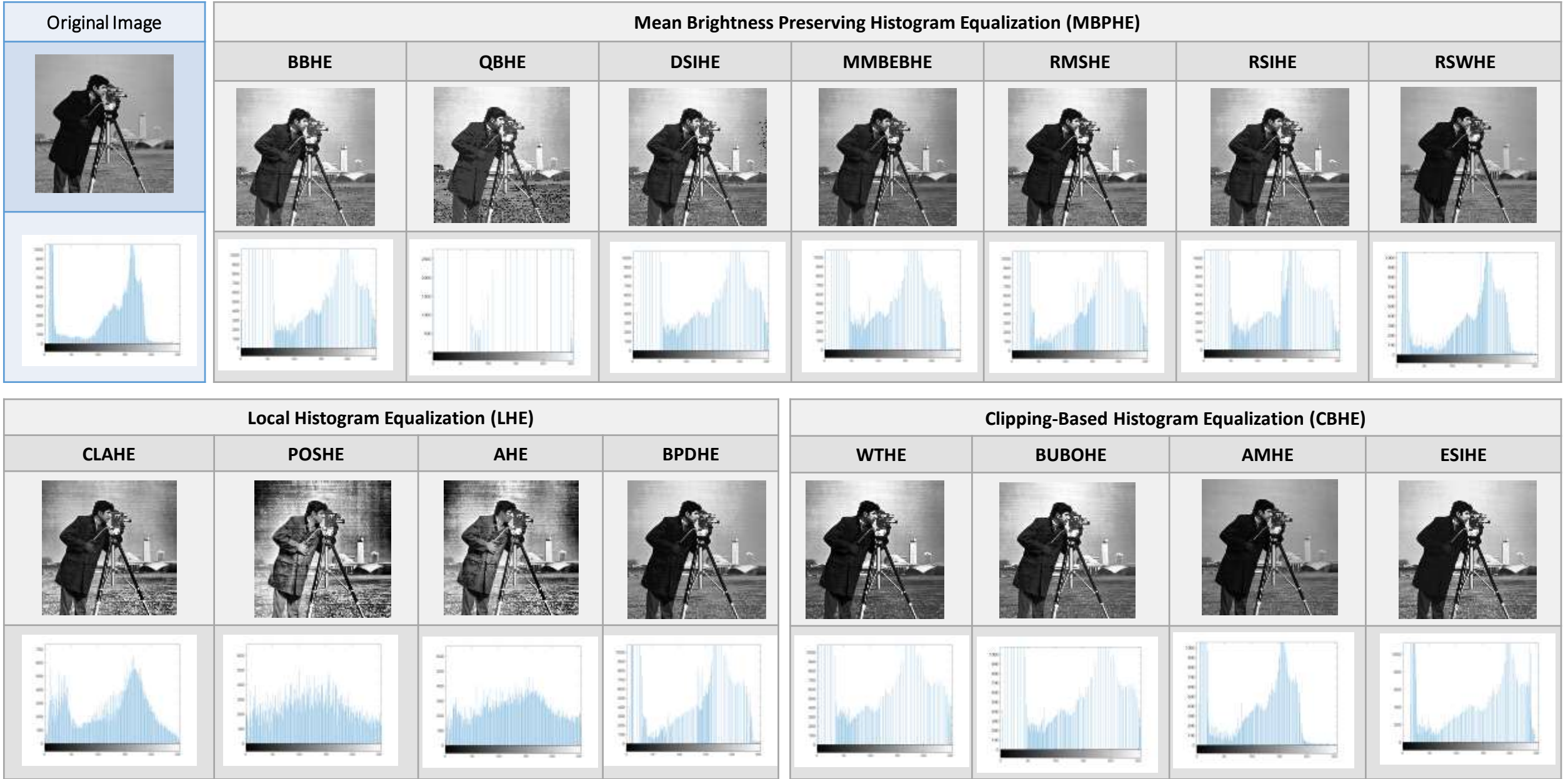


Fig.2 house

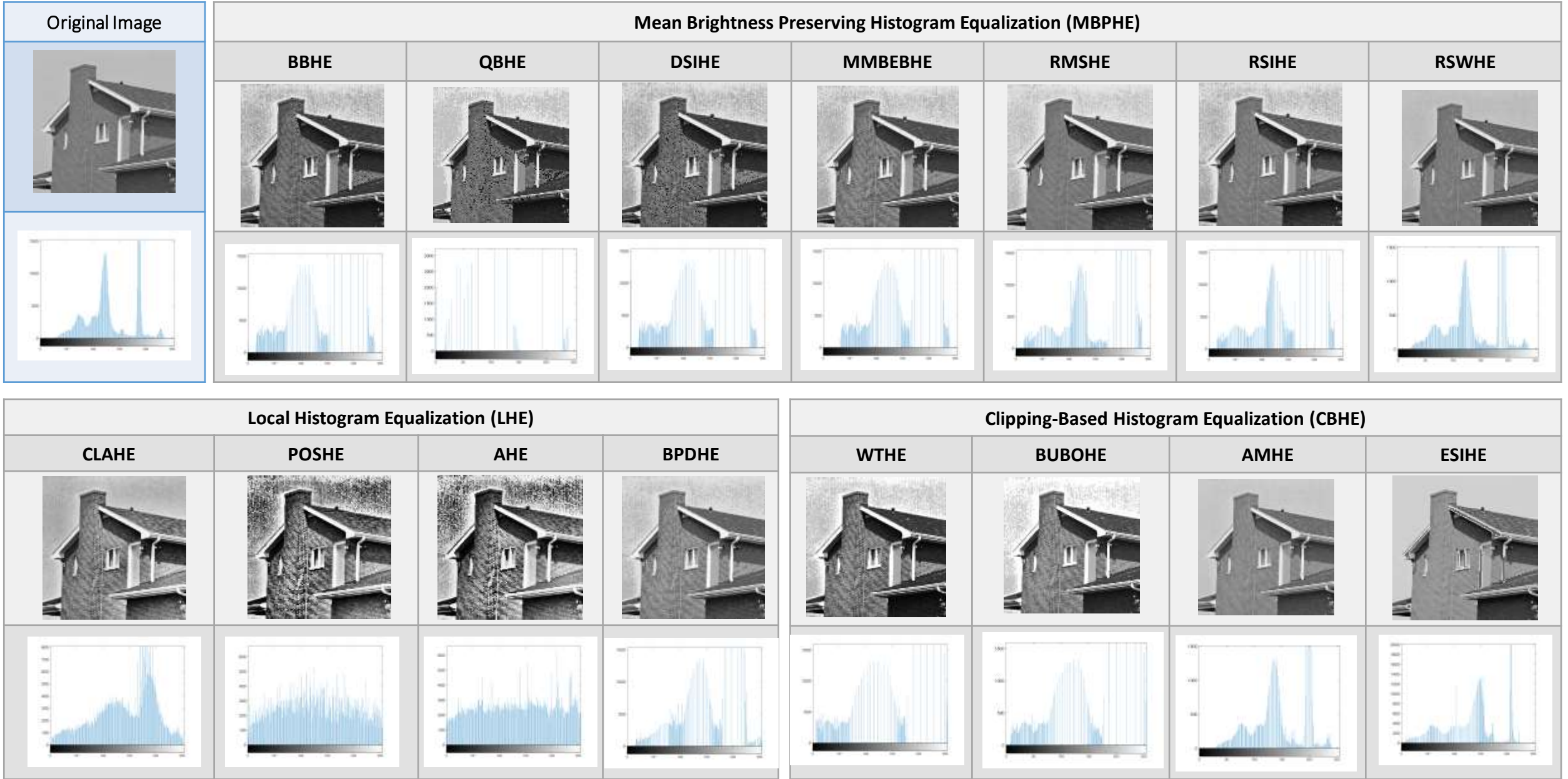


Fig.3 green pepper

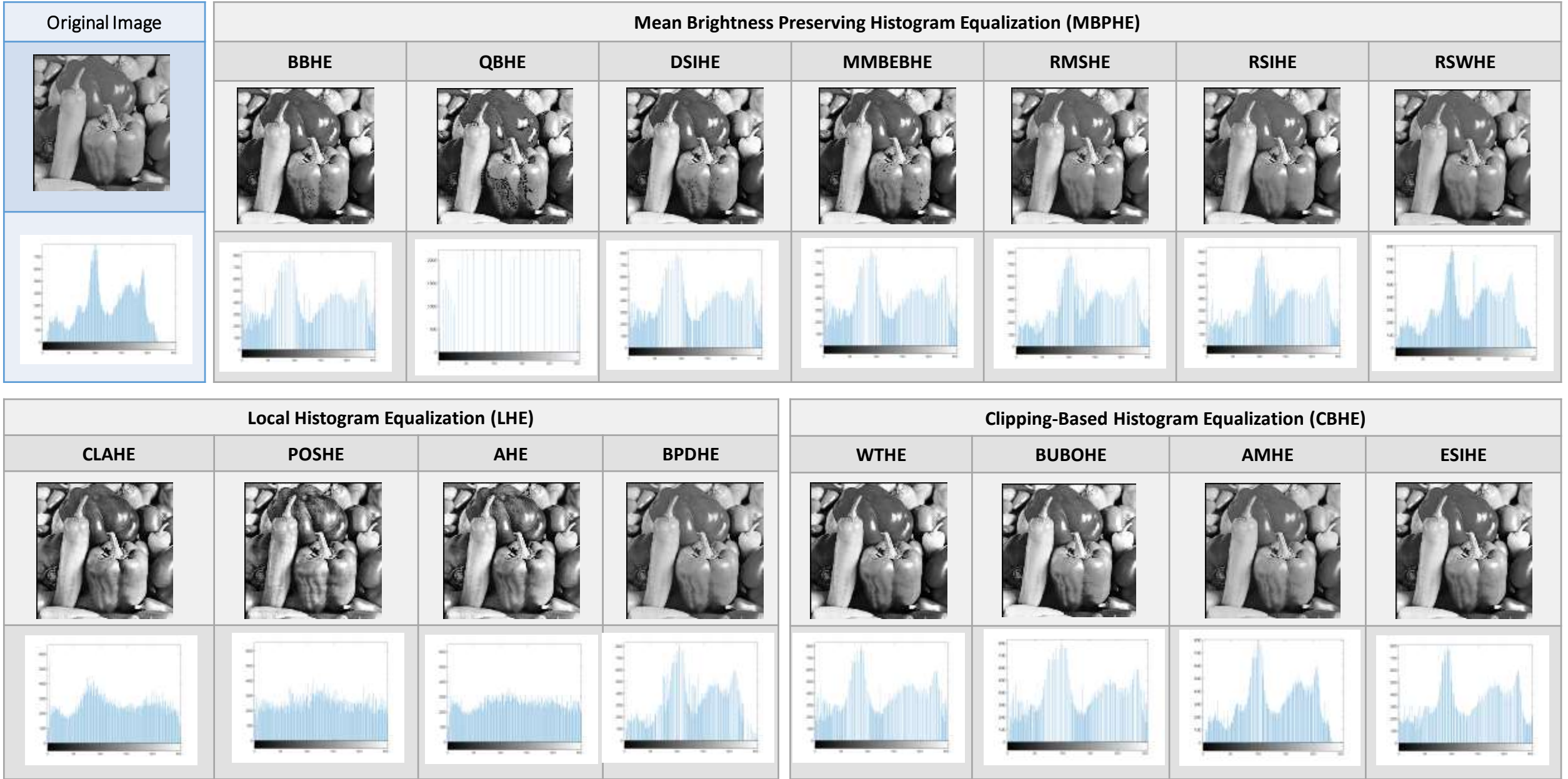


Fig.4 starfish

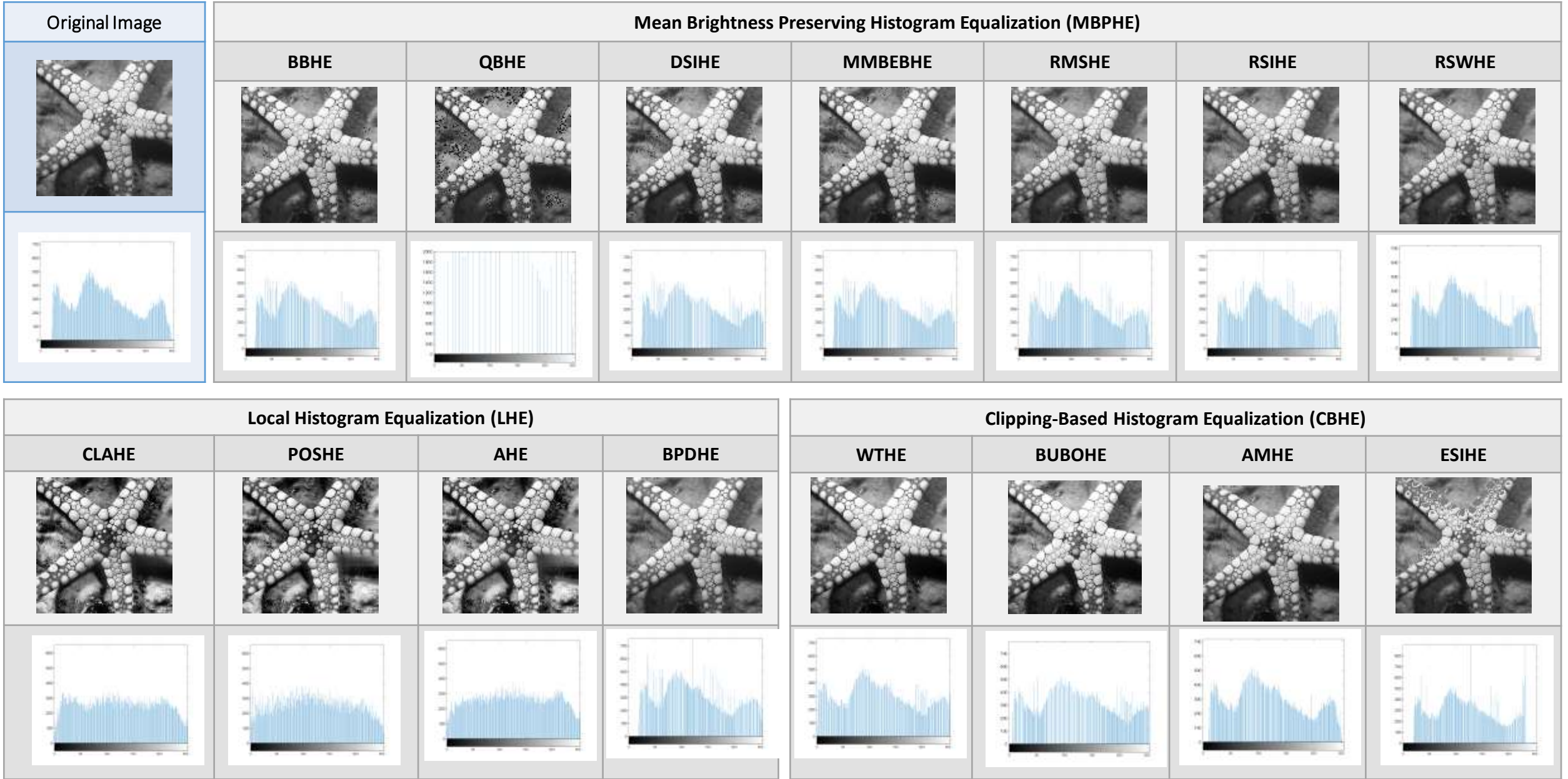


Fig.5 *butterfly*

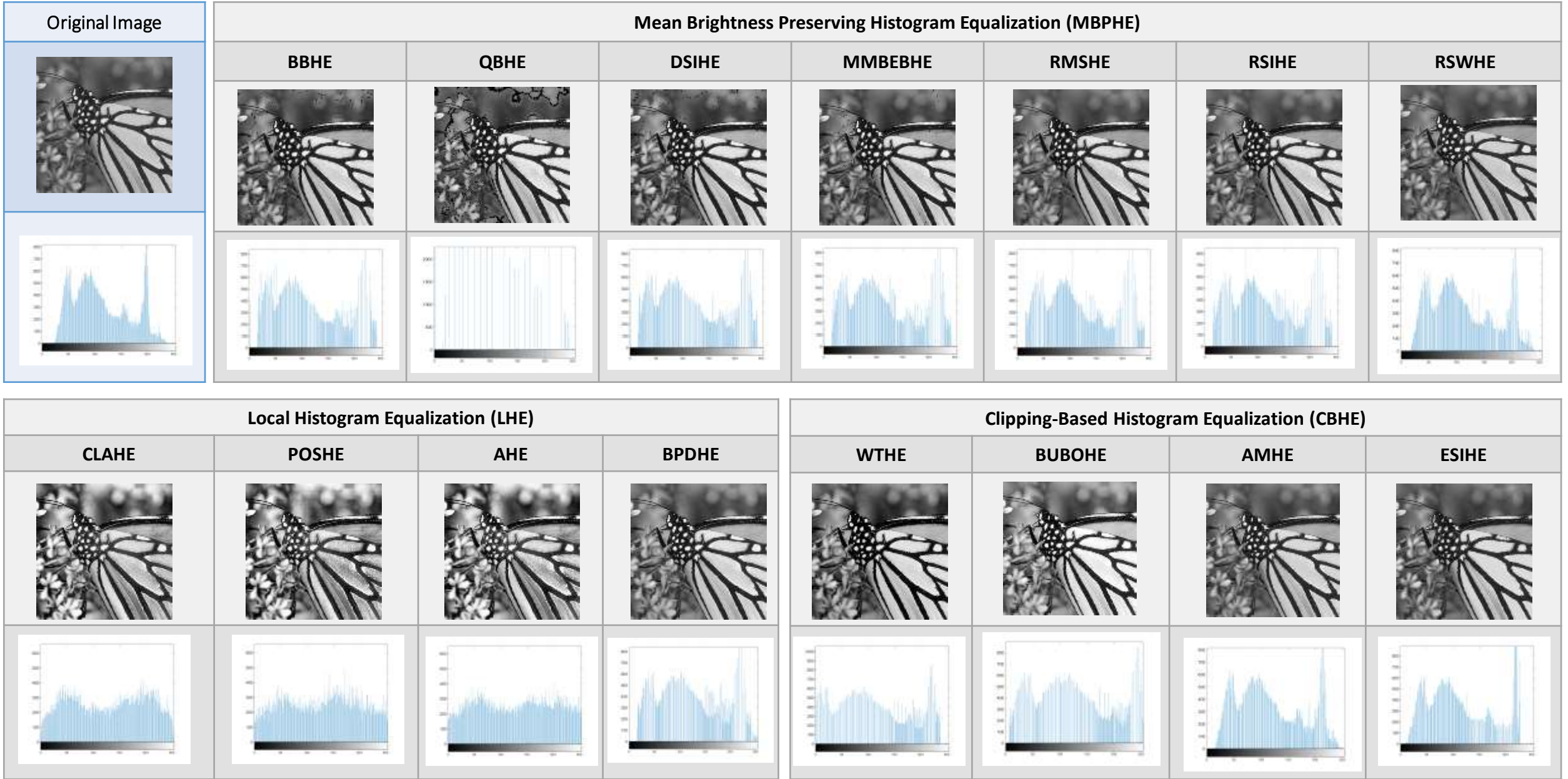


Fig.6 *plane*

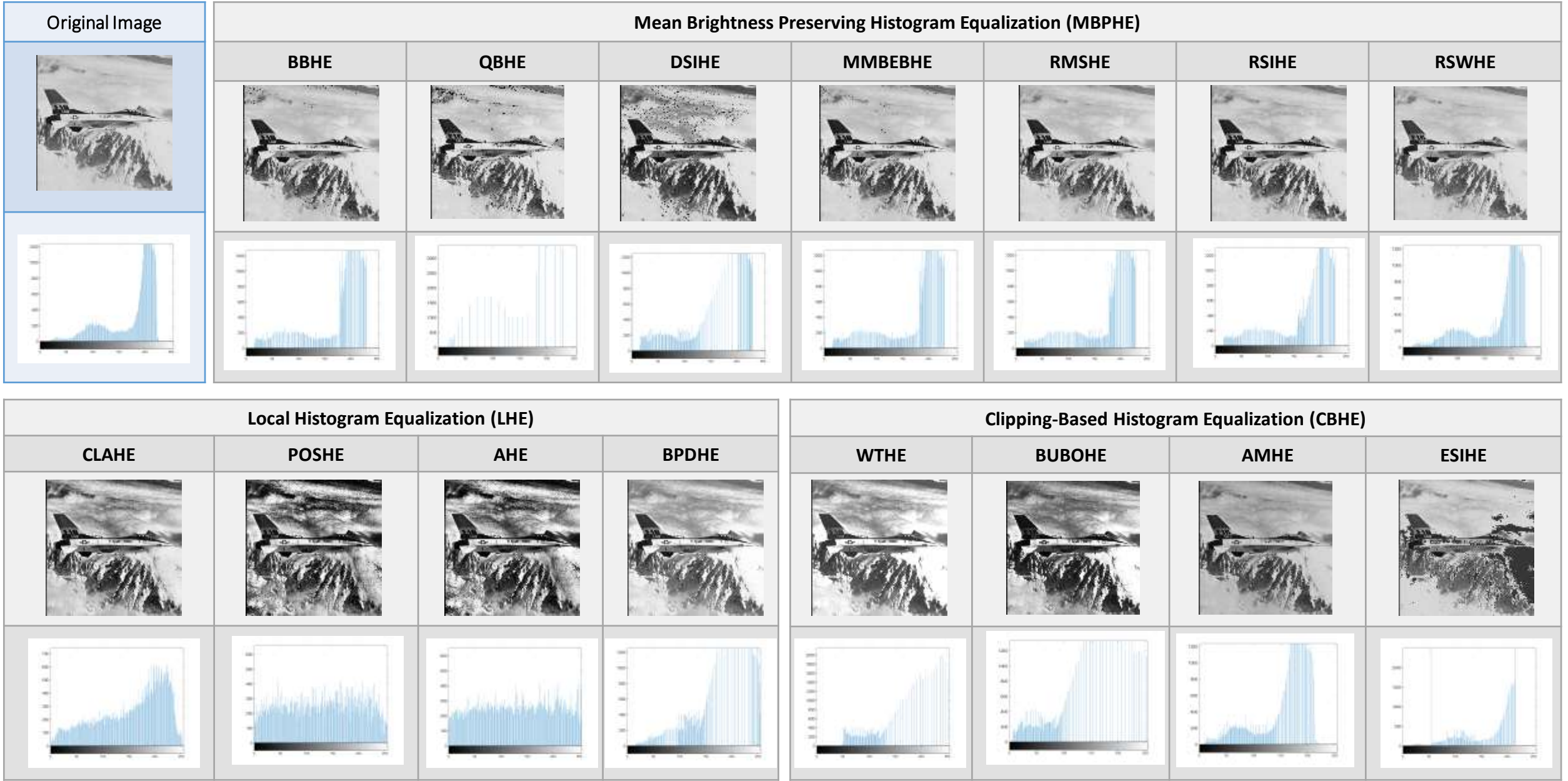


Fig.7 *parrot*

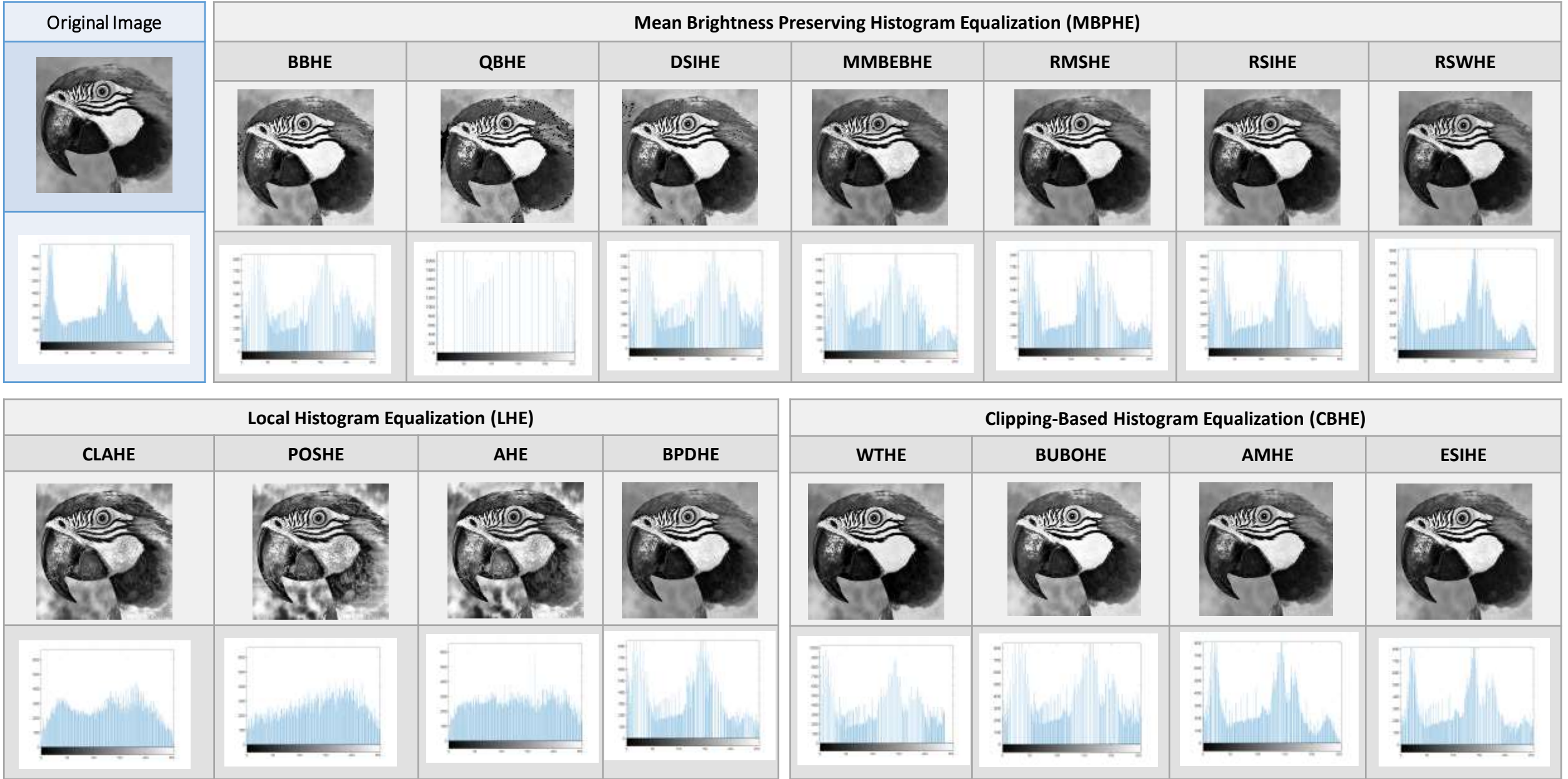


Fig.8 woman

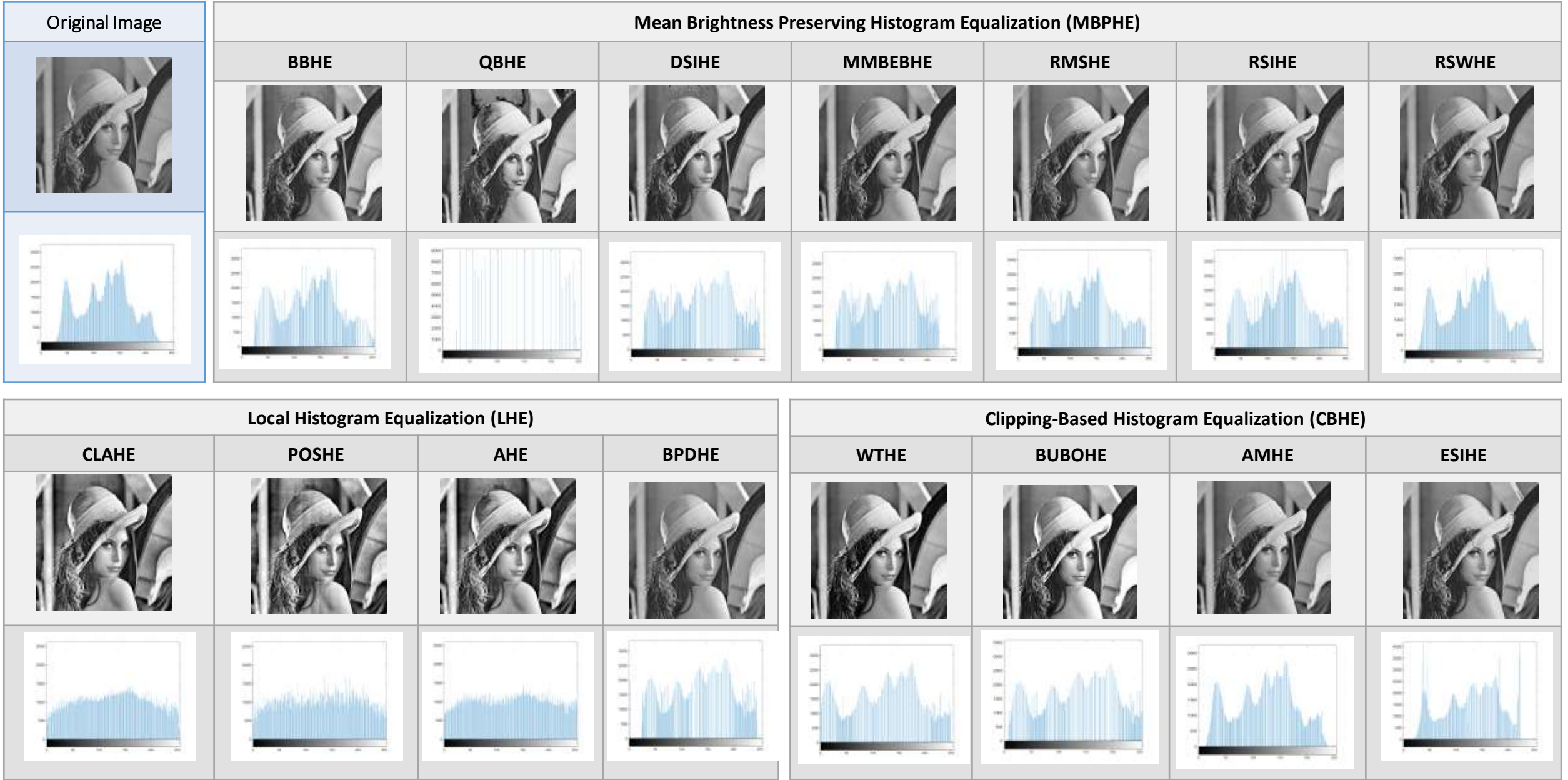


Fig.9 sitting woman

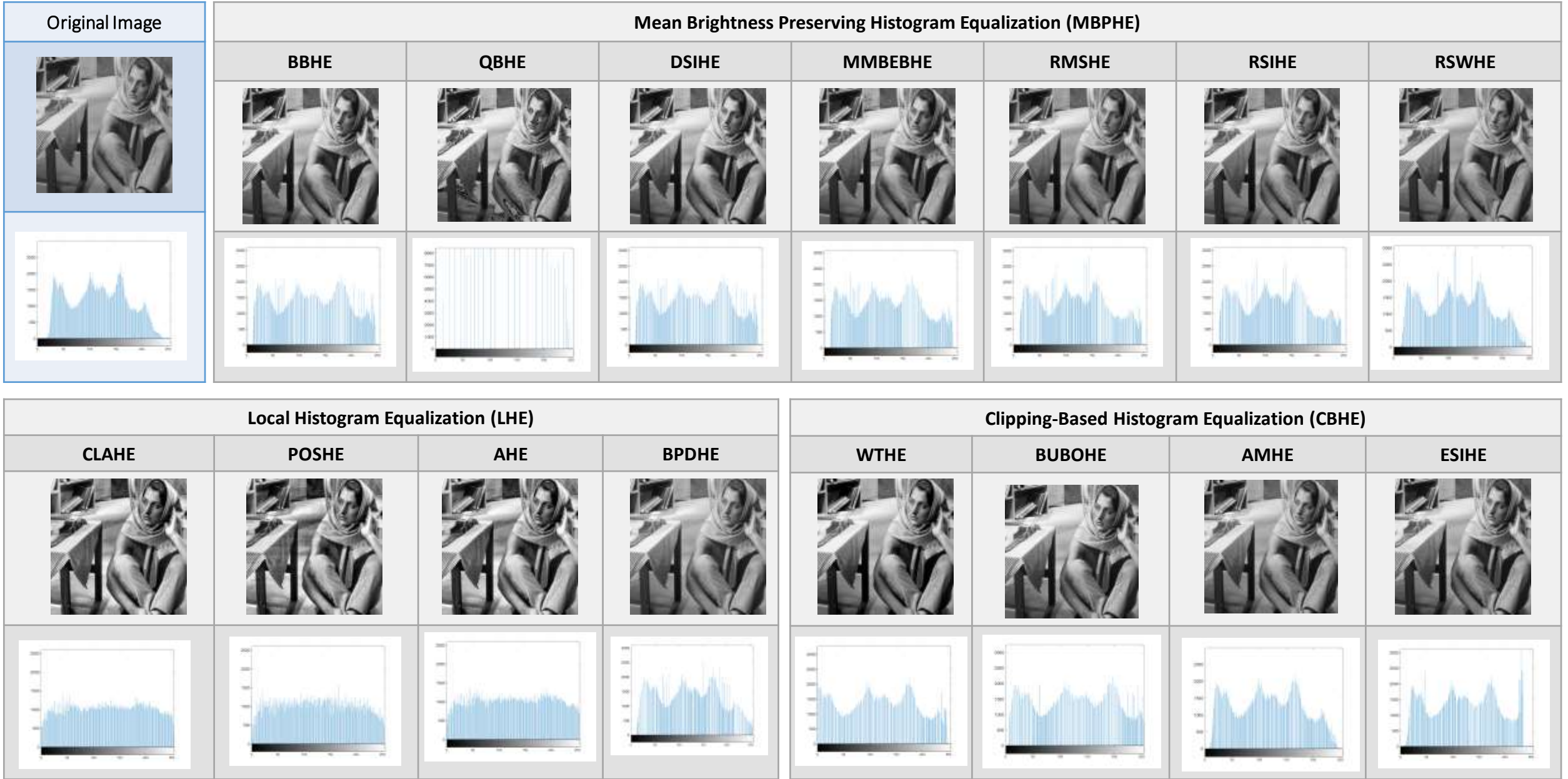


Fig.10 *ship*

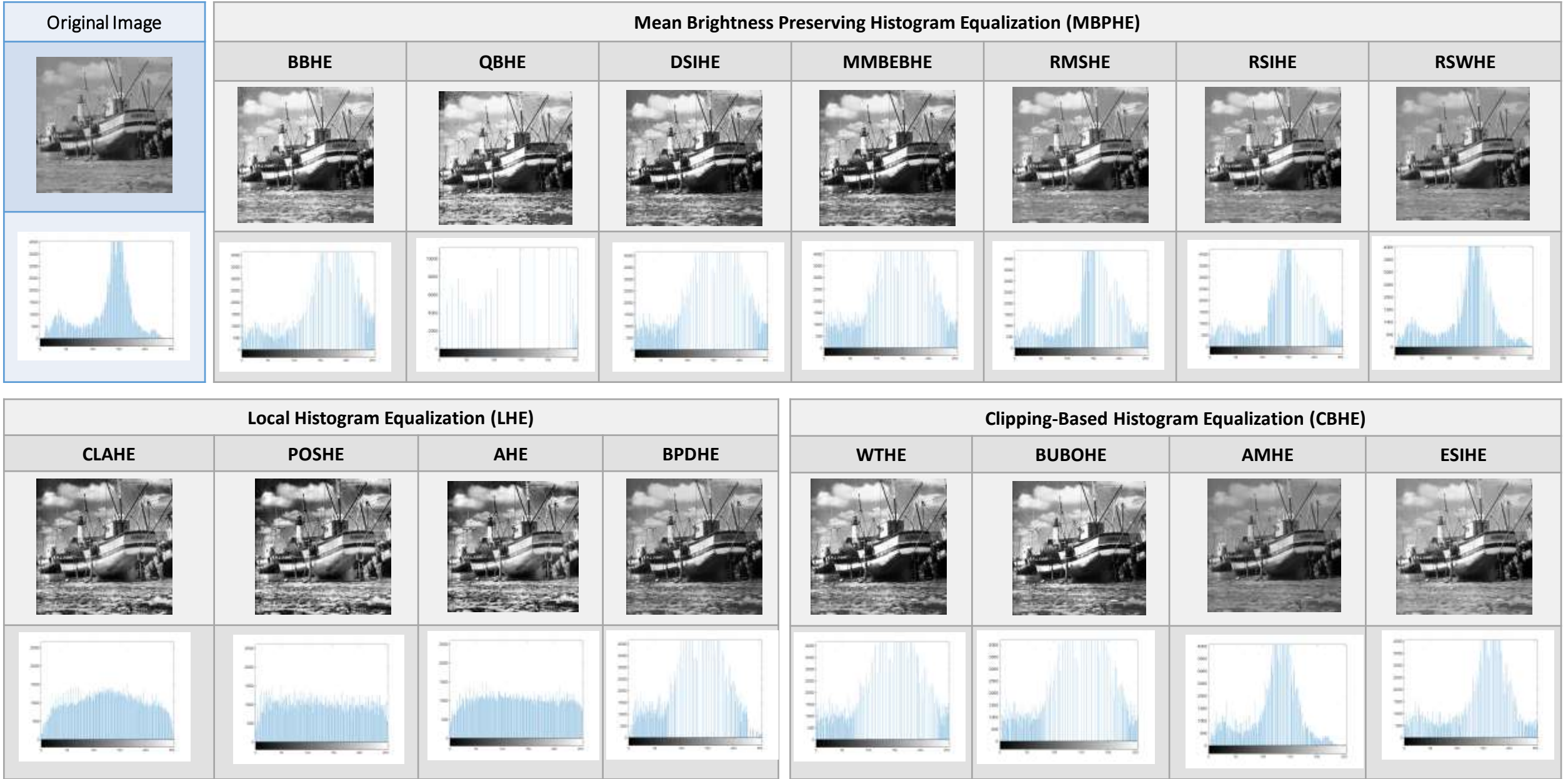


Fig.11 man

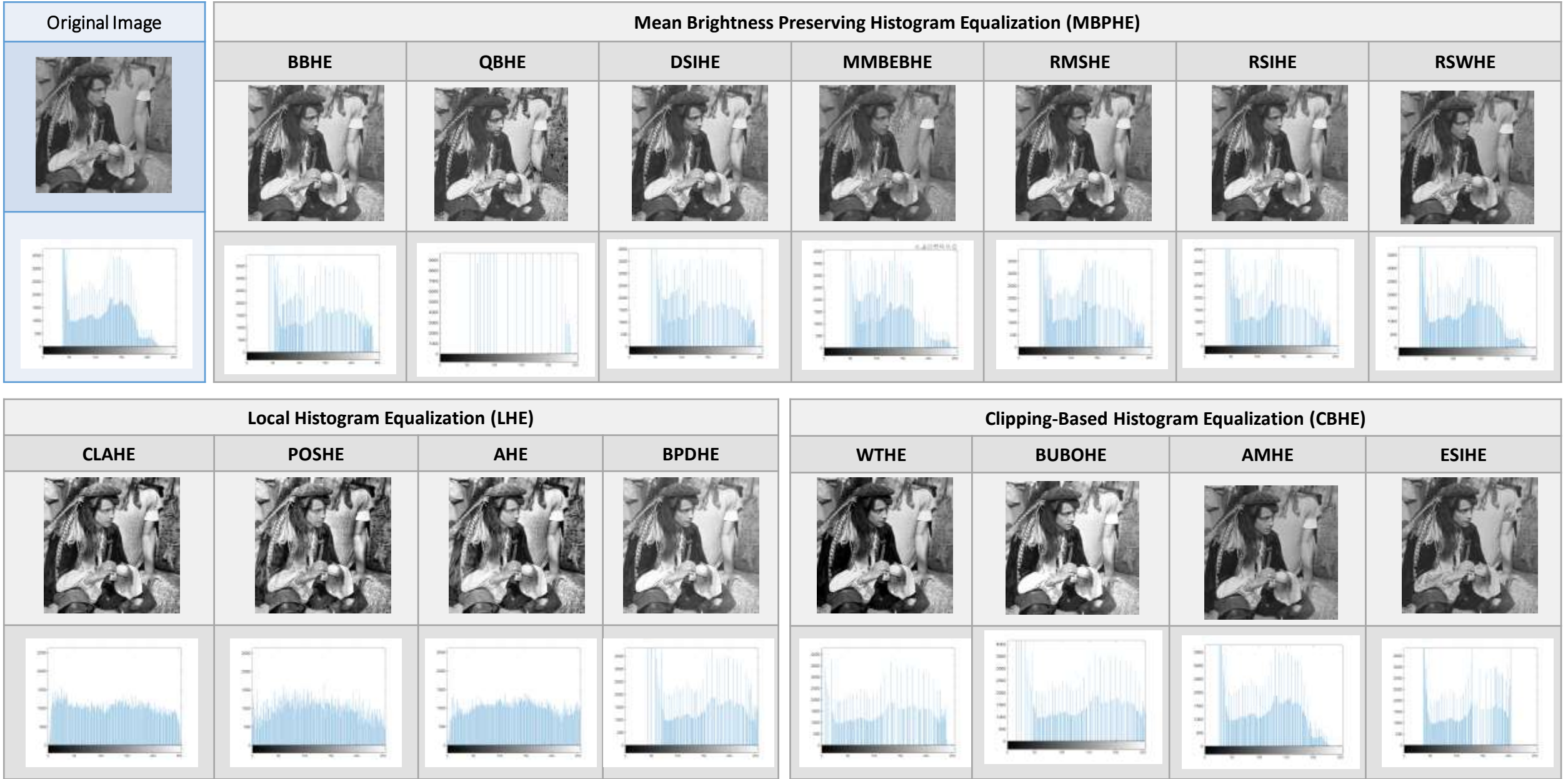


Fig.12 room

