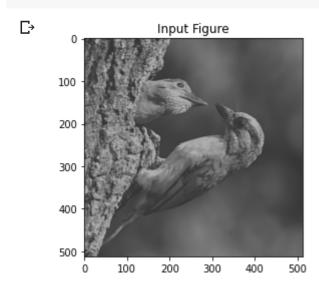
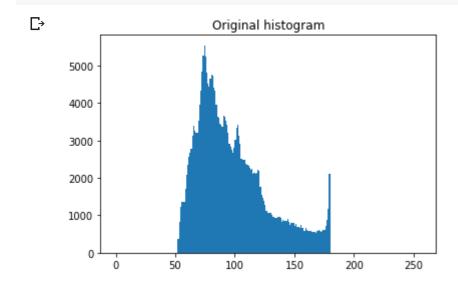
```
import os
from google.colab import drive
from matplotlib import pyplot as plt
import numpy as np
import cv2
import math
drive.mount('/content/gdrive')
```

os.chdir("/content/gdrive/My Drive/影像處理") #更改路徑

```
img = cv2.imread('Bird feeding 3 low contrast.tif', cv2.IMREAD_GRAYSCALE)
show_img = cv2.cvtColor(img, cv2.COLOR_BGR2RGB)
plt.imshow(show_img)
plt.title('Input Figure')
plt.show()
```



```
plt.hist(img.ravel(),256,[0,256])
plt.title('Original histogram')
plt.show()
```

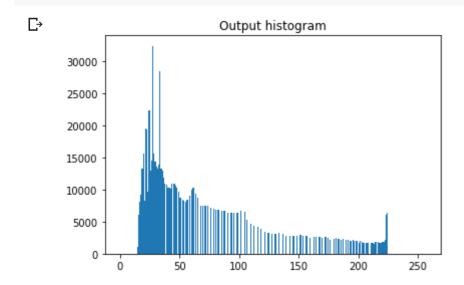


```
new_img = ((np.arctan((show_img - 128.0) / 32.0) + 1.3258) * 96.234).astype(int)
plt.imshow(new_img)
plt.title('Output Figure')
plt.show()
```

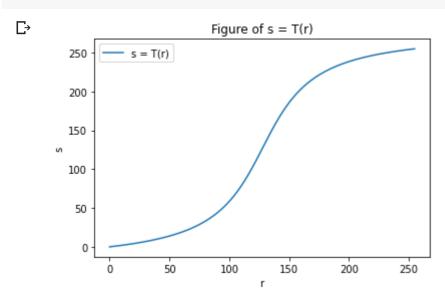
```
Output Figure

100 - 200 - 300 - 400 500
```

```
plt.hist(new_img.ravel(),256,[0,256])
plt.title('Output histogram')
plt.show()
```



```
x = np.arange(0, 255, 0.1)
y = (np.arctan((x - 128.0) / 32.0) + 1.3258) * 96.234
plt.plot(x, y, label="s = T(r)")
plt.xlabel("r")
plt.ylabel("s")
plt.title('Figure of s = T(r)')
plt.legend()
plt.show()
```



х :	f(x)	х :	f(x)	Х	f(x)	х :	f(x)
0	-0.0016998454294	19	3.9030916740624	38	9.298048614221	57	17.1722912995943
1	0.1765110619657	20	4.1437513786899	39	9.6389247621793	58	17.6860481804599
2	0.357380577646	21	4.388543219554	40	9.9866522461136	59	18.2120914547793
3	0.5409673347824	22	4.6375712905712	41	10.341430362325	60	18.7508346019095
4	0.7273316624457	23	4.8909430928018	42	10.703465804613	61	19.3027081219318
5	0.9165356457401	24	5.1487696694843	43	11.0729729879891	62	19.8681602996884
6	1.1086431884338	25	5.4111657472288	44	11.450174387969	63	20.447657999646
7	1.3037200782062	26	5.6782498836794	45	11.8353008961963	64	21.0416874918035
8	1.5018340546335	27	5.9501446219706	46	12.2285921931723	65	21.6507553086423
9	1.7030548800432	28	6.2269766523187	47	12.6302971388969	66	22.2753891328526
10	1.9074544133736	29	6.5088769811094	48	13.0406741822513	67	22.9161387152512
11	2.1151066871832	30	6.7959811078586	49	13.4599917899742	68	23.5735768219212
12	2.326087987959	31	7.0884292104439	50	13.8885288961104	69	24.2483002091508
13	2.5404769398846	32	7.3863663390264	51	14.3265753728229	70	24.9409306242047
14	2.7583545922338	33	7.6899426190986	52	14.7744325234822	71	25.6521158293271
15	2.9798045105677	34	7.9993134641228	53	15.2324135989504	72	26.3825306456198
16	3.2049128719178	35	8.3146397982412	54	15.7008443379872	73	27.1328780125675
17	3.4337685641526	36	8.6360882895663	55	16.1800635326996	74	27.9038900579511
18	3.6664632897316	37	8.963831594583	56	16.6704236199474	75	28.6963291717028
х :	f(x)	х :	f(x)	X :	f(x)	Х :	f(x)
76	29.5109890758721	95	50.5246240566562	114	87.899130763317	133	142.5029936623085
77	30.3486958812806	96	52.00503034361	115	90.4520043931458	134	145.4238118198857
78	31.210309119601	97	53.5324258846419	116	93.0611005171818	135	148.3117700727121
79	32.0967227374934	98	55.1082768278842	117	95.7243373544545	136	151.1623138673507
80	33.0088660370165	99	56.7340397794013	118	98.439214776803	137	153.9712676910492
81	33.9477045437886	100	58.4111510164126	119	101.2028067089508	138	156.734859623197
82	34.9142407812508	101	60.1410141116478	120	104.0117605326493	139	159.4497370455454
83	35.9095149258667	102	61.9249858581835	121	106.8623043272879	140	162.1129738828182
84	36.9346053141227	103	63.7643603999218	122	109.7502625801143	141	164.7220700068542
85	37.9906287677574	104	65.6603514963871	123	112.6710807376915	142	167.274943636683
86	39.078740698708	105	67.6140728831251	124	115.619858654787	143	169.7699177013707
87	40.2001349497941	106	69.6265167320479	125	118.5913926419843	144	172.2057012045836
88	41.3560433211613	107	71.6985302707688	126	121.5802254388491	145	174.5813666459621
89	42.5477347259712	108	73.8307906872276	127	124.5807030696716	146	176.8963245235435
90	43.7765139117816	109	76.0237785261127	128	127.5870372	147	179.1502958738872
91	45.0437196765588	110	78.2777498764565	129	130.5933713303284	148	181.3432837127724
92	46.3507225003851	111	80.5927077540379	130	133.593848961151	149	183.4755441292312
93	47.6989215058065	112	82.9683731954164	131	136.5826817580157	150	185.5475576679522
94	49.0897406515866	113	85.4041566986293	132	139.554215745213	151	187.5600015168749

153 191.4097140000782 172 218.2394690858773 191 233.5233190913577 210 242.945482206827	x : f(x) :	x <b>‡</b> f(x)	. x	f(x)	х :	f(x
14   193_2490885418165   173   219_2645594741333   192   234_1323869081965   211   243_38775309305155   195_0330602883522   174   220_2598336187492   193   234_726416400354   212   243_72390001203   215   244_72239081656   196_762923835874   175   221_262038628358   196   235_8713662780691   214   244_4700085938   225_20.065797571188   177   223_0773516625066   196   236_422329790905   215   244_83284403767   225_016416485155581   178   223_967356280399   197   236_0619829452207   215_245_8326403767   225_06164064954045639   176   223_963756280399   197   236_0619829452207   215_245_8326403767   225_0616464954533439   180   225_663085241279   199   238_0007831004056   218   245_8760576877   245_876405185   181   226_4777452282972   200   238_5096507600525   219   246_21024280541   240_246_21024280541   240_246_21024280541   240_246_21024280541   240_246_21024280541   240_246_21024280541   240_246_21024280541   240_246_21024280541   240_246_246_24024280541   240_246_2404941935   182   227_2701843420489   201_238_940108673004   220_246_537986110433   240_246_2404941935   182   227_2701843420489   201_238_940108673004   220_246_537986110433   240_246_2404941935   182   227_2701843420489   201_238_940108673004   220_246_537986110433   240_246_2404941935   182   227_2701843420489   201_238_940108673004   220_246_537986110433   240_246_2404941935   240_246	152 189.5137229036129	171 217.1834456322426	190	232.8986852671474	209	242.543777261103
155 196.03306028895322 174 220.2596336187492 193 234.726416400054 212 243.73390012031 155 196.0330602889552 175 221.2265698562114 194 235.3059141003116 213 244.101101412010 157 198.4400346205698 176 222.165203629355 195 235.8713662780681 214 244.4706059538 158 200.0657975721158 177 223.0773516625066 196 236.4223397890905 215 244.83264403767 159 201.6416485153581 178 223.9673652800399 197 236.9619820452207 216 245.187422153886 100 203.16904406599 179 224.8253765187194 198 237.489026215401 217 245.55149837822 1161 204.6694503433439 180 225.663085241279 199 238.0017831004056 218 245.87602578577 162 206.0643373494135 181 226.4777452282972 200 238.5036507800525 219 246.52798571 162 206.0643373494135 181 227.7701843420489 201 238.994108673004 220 246.557986110433 183 228.0411963874325 202 239.471320020128 221 246.85944901758 163 207.475152841923 182 227.7701843420489 201 238.994108673004 220 245.537986110433 164 208.823318996149 183 228.0411963874325 202 239.471320020128 221 246.85944901758 165 210.1303547234412 184 228.7915437543802 203 239.9416608010496 222 247.17476035877 166 211.3975604882184 185 229.5219585706729 204 240.3996411876178 223 247.484131780901 167 212.6263396740288 186 230.2331437757953 205 240.8474990271771 224 247.787708060973 168 213.8180310788387 187 230.925774190892 206 241.2855455038966 225 248.085645189566 224.9739394502099 188 231.6004975780788 207 241.7440826100258 226 248.378903392141 216.095333701292 189 232.2579356847488 208 242.1334002177487 27 248.665197418890 124.97629086527712 250 254.0654312115663 225 250.0253047305157 251 254.2575387542599 225 250.0253047305157 251 254.2575387542599 225 250.0253047305157 251 254.2575387542599 225 250.0253047305157 251 254.2575387542599 225 250.0253047305157 251 254.2575387542599 225 250.0253047305157 251 254.2575387542599 225 250.0253047305157 251 254.2575387542599 225 250.0253047305157 251 254.2575387542599 225 250.0253047305157 251 254.2575387542599 225 250.0253047305157 251 254.2575387542599 225 250.0253047305157 251 254.2575387542599 225 250.025	153 191.4097140000782	172 218.2394690858773	191	233.5233190913577	210	242.945482206827
166 196.7629238358574 175 221.2263689562114 194 235.3059141003116 213 244.10110112101517 198.4400346205988 176 222.1652083629835 195 235.8713662780681 214 244.47060859538 158 200.0657975721158 177 223.0773516625066 196 236.423239780905 215 244.83264403767 159 201.6416485153881 178 223.093765280399 197 238.9619829452207 216 245.187422153886 202.046495034334399 180 225.663085341279 199 238.0017831004056 218 245.87602578577 162 206.0843337484135 181 226.4777452282972 200 238.5036507800525 219 246.21024280541 163 207.4751528941935 182 227.2701843420489 201 238.9940108673004 202 246.537981014968874225 202 239.4732300620128 201 246.659348010158 165 210.1303547234412 184 228.7915437543802 203 239.9415608010466 222 247.17476085877 165 210.303547234412 184 228.7915437543802 203 239.9415608010466 222 247.17476085877 166 211.3975604882184 185 229.5219865706729 204 240.3996418765178 223 247.484131780901 167 212.6263396740288 186 230.2331437757953 205 240.8474990271771 224 247.787708060973 168 213.8180310780387 187 230.9257741908492 206 241.285545503896 225 248.08564518956 169 214.9739394502059 188 231.6004975700788 207 241.7140865100258 226 248.08564518956 169 214.9739394502059 188 231.6004975700788 207 241.7140865100258 226 248.87803329141 170 216.095333701292 189 232.579356847488 208 242.1334002177487 227 248.665197418900 175 228 249.9239297780284 249 223.9274034326763 249 223.9274034326763 249 223.927780284 249 223.927780284 249 223.9274034326763 249 223.927780284 249 223.927780284 249 223.9274034326763 249 223.927780284 249 223.927780284 249 223.9273927780284 249 223.927780284 249 223.927780284 249 223.9274034326763 249 223.9274034326763 249 223.927780284 249 223.927780284 249 223.9274034326763 249 223.927780284 249 223.927780284 249 223.9274034326763 249 223.9274034326763 249 223.927780284 249 223.927780284 249 223.9274034326763 249 223.927780284 249 223.927780284 249 223.927780284 249 223.927780284 249 223.927780284 249 223.927780284 249 223.927780284 249 223.927780284 249 223.927780284 249 223.927780284 249 223.9277	154 193.2490885418165	173 219.2645594741333	192	234.1323869081965	211	243.338773503803
187 198.400346205988	155 195.0330602883522	174 220.2598336187492	193	234.726416400354	212	243.72390001203
188 20.0657975721L58	156 196.7629233835874	175 221.2263698562114	194	235.3059141003116	213	244.101101412010
159         201.6416485153681         178         223.963765280399         197         236.661982945207         216         245.187422153888           160         203.16904405639         179         224.8253785187194         198         237.4880262195401         217         224.5555149637826           161         204.6494503433439         180         225.6630853241279         199         238.0017831004056         218         245.87602578577           162         206.0843337484135         181         226.4777452282972         200         238.5036507800525         219         246.21024280541           163         207.4751528941935         182         227.7701843420489         201         238.9940108673004         220         246.537986110433           164         208.8233518996149         183         228.0411963874325         202         239.4732300620128         221         246.859434601758           165         210.1303547234412         184         228.7915437543802         203         239.9416608010496         222         247.174760935877           166         211.3975604882184         185         29.5219585706729         204         240.3996418765178         223         247.884131780901           168         213.8180310788387         187         239.925774190849	157 198.4400346205988	176 222.1652083629835	195	235.8713662780681	214	244.47060859538
160 203.169044056399 179 224.8253785187194 198 237.4880262195401 217 245.535149637820 161 204.6494503433439 180 225.6630853241279 199 238.0017831004056 218 245.87602578571 162 206.0843337484135 181 226.4777452282977 200 238.5036507800525 219 246.21024280541 163 207.4751528941935 182 227.2701843420489 201 238.9940108673004 220 246.537966110433 164 208.8233518996149 183 228.0411963874325 202 239.4732300620128 221 246.859434601755 165 210.1303547234412 184 228.7915437543802 203 239.9416608010496 222 247.17476935877 166 211.3975604882184 185 229.5219585706729 204 240.3996418765178 223 247.484131780901 167 212.6263396740288 186 230.2331437757953 205 240.8474990271771 224 247.787708060973 168 213.8180310788387 187 230.9257741908492 206 241.2855455038896 225 248.085645189556 169 214.9739394502059 188 231.6004975780788 207 241.7140826100258 226 248.378093292141 170 216.095333701292 189 232.2579356847488 208 242.1334002177487 227 248.665197418806 229 249.2239297780294 248 253.6722403453665 230 249.4968245163206 249 253.8703543217938 231 249.7629086527712 250 254.0654312115663 232 250.0253047305157 251 254.2578387542599 233 250.2831313071992 252 254.4467427375543 234 250.5365031094288 253 254.6331070652176 235 250.785531180446 254 254.816693822354 240 251.90303230213102 255 254.9975633380343 242 252.14703058358474 240 251.9091615280822 241 252.1942698984333 242 252.4157198077662 243 252.63535974601155	158 200.0657975721158	177 223.0773516625066	196	236.4232397980905	215	244.83264403767
161 204.6494S03433439 180 225.6630853241279 199 238.0017831004056 218 245.87602578577 162 206.0843337484135 181 226.477745282972 200 238.5036607800525 219 246.21024280541 163 207.4751528941935 182 227.2701843420489 201 238.9940108673004 220 246.557986110433 164 208.8233518996149 183 228.0411963874325 202 239.4732300620128 221 246.859434601755 165 210.1303547234412 184 228.7915437543802 203 239.9416608010496 222 247.174760935677 166 211.3975604882184 185 229.5219585706729 204 240.3996418765178 223 247.484131780901 167 212.6263396740288 186 230.2331437757953 205 240.8474990271771 224 247.787708069972 168 213.8180310788387 187 230.9257741908492 206 241.2855455038896 225 248.085645189565 169 214.9739394502059 188 231.6004975780788 207 241.7140826100258 226 248.378093292141 170 216.095333701292 189 232.2579356847488 208 242.1334002177487 227 248.665197418806 228 248.9470977476813 247 253.4710195199568 229 249.2239297780294 248 253.6722403453665 230 249.955245163206 249 253.8703543217938 231 249.7629086527712 250 254.0654312115663 232 250.0253047305157 251 254.2575387542599 233 250.2831313071982 252 254.4467427375543 234 250.5365031094288 253 254.6331070652176 235 251.2709827259376 236 251.070303230213102 255 254.9975633380343 247 251.2709827259376 248 251.942698894323 252 252.4157198077662 249 252.4157198077662 243 252.6335974601155	159 201.6416485153581	178 223.963765280399	197	236.9619829452207	216	245.187422153886
162 26.0843337484135 181 226.477452282972 200 238.5036507800525 219 246.51024280541 163 207.4751528941935 182 227.2701843420489 201 238.9940108673004 220 246.537986110433 164 208.8233518996149 183 228.0411963874325 202 239.4732300620128 221 246.859434601758 165 210.1303547234412 184 228.7915437543802 203 239.9416608010496 222 247.174760935877 166 211.3975604882184 185 229.5219585706729 204 240.3996418765178 223 247.484131780901 167 212.62633396740288 186 230.2331437757953 205 240.8474990271771 224 247.787708069973 168 213.8180310788387 187 230.9257741908492 206 241.2855455038996 225 248.085645189568 169 214.9739394502059 188 231.6004975780788 207 241.7140826100258 226 248.085645189568 169 214.9739394502059 189 232.2579356847488 208 242.1334002177487 227 248.665197418890 170 216.095333701292 189 232.2579356847488 208 242.1334002177487 227 248.665197418890 172 228 248.947097747813 247 253.4710195199568 173 249.2539297780294 248 253.6722403453665 174 249.7629086527712 250 254.0654312115663 175 250.0253047305157 251 254.2575387542599 175 250.0253047305157 251 254.2575387542599 175 250.0253047305157 251 254.2575387542599 175 250.785531180446 254 254.816693822354 176 250.5365031094288 253 254.6331070652176 177 251.2709827259376 178 251.2709827259376 179 251.2709827259376 170 251.2709827259376 170 252.1740305838474 170 252.194698894323 170 252.54157198077662 170 252.54157198077662 170 252.54157198077662 170 252.54157198077662 170 252.54157198077662 170 252.54157198077662 170 252.54157198077662 170 252.54157198077662 170 252.54157198077662 170 252.54157198077662	160 203.16904405639	179 224.8253785187194	198	237.4880262195401	217	245.535149637820
163 207.4751528941935 182 227.2701843420489 201 238.9940108673004 220 246.537986110433 164 208.8233518996149 183 228.0411963874325 202 239.4732300620128 221 246.859843601758 165 210.1303547234412 184 228.7915437543802 203 239.941608010496 222 247.174760935877 166 211.3975604882184 185 229.5219585706729 204 240.3996418765178 223 247.484131780901 167 212.6263396740288 186 230.2331437757953 205 240.8474990271771 224 247.787708060973 168 213.8180310788387 187 230.9257741908492 206 241.285545503896 225 248.085645189556 169 214.9739394502059 188 231.6004975780788 207 241.7140826100258 226 248.876093292141 170 216.095333701292 189 232.2579356847488 208 242.1334002177487 227 248.665197418890 170 216.095333701292 248 253.4710195199568 1229 249.2239297780294 248 253.6732403453665 1230 249.4958245163206 249 253.8703543217938 1231 249.7629086527712 250 254.0654312115663 1232 250.0253047305157 251 254.2575387542599 1233 250.2831313071982 252 254.4467427375543 1234 250.5365031094268 253 254.6654312115663 1235 250.7855311800446 254 254.816693822354 1236 251.0303230213102 255 254.9975633380343 1242 252.147198077662 1243 252.1942698894323 1242 252.4157198077662 1243 252.6335974601155	161 204.6494503433439	180 225.6630853241279	199	238.0017831004056	218	245.87602578577
164 208.823351896149 183 228.0411963874325 202 239.4732300620128 221 246.859434601758	162 206.0843337484135	181 226.4777452282972	200	238.5036507800525	219	246.21024280541
165	163 207.4751528941935	182 227.2701843420489	201	238.9940108673004	220	246.537986110433
166       211.3975604882184       185       229.5219585706729       204       240.3996418765178       223       247.484131780901         167       212.6263396740288       186       230.2331437757953       205       240.8474990271771       224       247.787708060973         168       213.8180310788387       187       230.9257741908492       206       241.2855455038896       225       248.085645189556         169       214.9739394502059       188       231.6004975780788       207       241.7140826100258       226       248.085645189556         170       216.095333701292       189       232.2579356847488       208       242.1334002177487       227       248.665197418890         x	164 208.8233518996149	183 228.0411963874325	202	239.4732300620128	221	246.859434601758
167 212.6263396740288	165 210.1303547234412	184 228.7915437543802	203	239.9416608010496	222	247.174760935877
168 213.8180310788387	166 211.3975604882184	185 229.5219585706729	204	240.3996418765178	223	247.484131780901
169	167 212.6263396740288	186 230.2331437757953	205	240.8474990271771	224	247.787708060973
170	168 213.8180310788387	187 230.9257741908492	206	241.2855455038896	225	248.085645189556
x         f(x)         x         f(x)         x         f(x)         x         f(x)         x         x         f(x)         x         x         f(x)         x         x         f(x)         x	169 214.9739394502059	188 231.6004975780788	207	241.7140826100258	226	248.378093292141
228       248.9470977476813       247       253.4710195199568         229       249.2239297780294       248       253.6722403453665         230       249.4958245163206       249       253.8703543217938         231       249.7629086527712       250       254.0654312115663         232       250.0253047305157       251       254.2575387542599         233       250.2831313071982       252       254.4467427375543         234       250.5365031094288       253       254.6331070652176         235       250.785531180446       254       254.816693822354         236       251.0303230213102       255       254.9975633380343         237       251.2709827259376         238       251.7403058358474       240       251.9691615280822         241       252.1942698894323       242       252.4157198077662         243       252.6335974601155       247       253.47157198077662	170 216.095333701292	189 232.2579356847488	208	242.1334002177487	227	248.665197418890
229       249.2239297780294       248       253.6722403453665         230       249.4958245163206       249       253.8703543217938         231       249.7629086527712       250       254.0654312115663         232       250.0253047305157       251       254.2575387542599         233       250.2831313071982       252       254.4467427375543         234       250.5365031094288       253       254.6331070652176         235       250.785531180446       254       254.816693822354         236       251.2709827259376       255       254.9975633380343         239       251.7403058358474       240       251.9691615280822         241       252.1942698894323       242       252.4157198077662         243       252.6335974601155       254       253.6722403453663	x : f(x) :	x : f(x)	:			
230       249.4958245163206       249       253.8703543217938         231       249.7629086527712       250       254.0654312115663         232       250.0253047305157       251       254.2575387542599         233       250.2831313071982       252       254.4467427375543         234       250.5365031094288       253       254.6331070652176         235       250.785531180446       254       254.816693822354         236       251.0303230213102       255       254.9975633380343         237       251.2709827259376       255.254.9975633380343         239       251.7403058358474       240       251.9691615280822         241       252.1942698894323       242       252.4157198077662         243       252.6335974601155	228 248.9470977476813	247 253.4710195199568				
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235	233 250.2831313071982	252 254.4467427375543				
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239       251.7403058358474         240       251.9691615280822         241       252.1942698894323         242       252.4157198077662         243       252.6335974601155	237 251.2709827259376					
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241       252.1942698894323         242       252.4157198077662         243       252.6335974601155	239 251.7403058358474					
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