In [33]:
```
import keras
from keras.models import Sequential
from keras.layers import Dense, Dropout, Flatten
from keras.layers import Conv2D, MaxPooling2D, Conv3D, BatchNormalization
from keras import backend as K
import os
from PIL import Image
import numpy as np
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import OneHotEncoder
import matplotlib.pyplot as plt
from matplotlib.pyplot import imshow
from random import randrange
```

In [2]:
```
enc = OneHotEncoder()
enc.fit([[0], [1]])
def names(number):
    if(number == 0):
        return 'Dog'
    else:
        return 'Cat'
```

```
C:\Users\Vee\Anaconda3\lib\site-packages\sklearn\preprocessing\_encoders.py:41
5: FutureWarning: The handling of integer data will change in version 0.22. Cur
rently, the categories are determined based on the range [0, max(values)], whil
e in the future they will be determined based on the unique values.
If you want the future behaviour and silence this warning, you can specify "cat
egories='auto'".
In case you used a LabelEncoder before this OneHotEncoder to convert the catego
ries to integers, then you can now use the OneHotEncoder directly.
  warnings.warn(msg, FutureWarning)
```

In [3]:
```
data = []
paths = []
ans = []
for r, d, f in os.walk(r"D:\Downloads\train\train\cat"):
    for file in f:
        if '.jpg' in file:
            paths.append(os.path.join(r, file))

for path in paths:
    img = Image.open(path)
    x = img.resize((128,128))
    data.append(np.array(x))
    ans.append(enc.transform([[1]]).toarray())
```

In [4]:
```
paths = []
for r, d, f in os.walk(r"D:\Downloads\train\train\dog"):
    for file in f:
        if '.jpg' in file:
            paths.append(os.path.join(r, file))

for path in paths:
    img = Image.open(path)
    x = img.resize((128,128))
    data.append(np.array(x))
    ans.append(enc.transform([[0]]).toarray())
```

In [5]:
```
data = np.array(data)
data.shape
```

Out[5]:
```
(25000, 128, 128, 3)
```

In [6]:
```
ans = np.array(ans)
ans = ans.reshape(25000,2)
```

In [7]:
```
#splitting data into train and test sets. 3/4 train, 1/4 test.
x_train,x_test,y_train,y_test = train_test_split(data, ans, test_size=0.2, shuff
```

In [8]:
```
model = Sequential()
model.add(Conv2D(32, kernel_size=(3, 3), input_shape=(128, 128, 3)))
model.add(BatchNormalization())
model.add(MaxPooling2D(pool_size=(2, 2)))
model.add(Dropout(0.25))
model.add(Conv2D(32, (3, 3), activation='relu'))
model.add(BatchNormalization())
model.add(MaxPooling2D(pool_size=(2, 2)))
model.add(Dropout(0.25))
model.add(Flatten())
model.add(Dense(256, activation='relu'))
model.add(Dropout(0.5))
model.add(Dense(256, activation='relu'))
model.add(Dropout(0.5))
model.add(BatchNormalization())
model.add(Dropout(0.5))
model.add(Dense(2, activation='softmax'))
model.compile(loss='mean_squared_error', optimizer='adam')
print(model.summary())
```

```
WARNING:tensorflow:From C:\Users\Vee\Anaconda3\lib\site-packages\keras\backend
\tensorflow_backend.py:4070: The name tf.nn.max_pool is deprecated. Please use
tf.nn.max_pool2d instead.

Model: "sequential_1"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv2d_1 (Conv2D)            (None, 126, 126, 32)      896
_________________________________________________________________
batch_normalization_1 (Batch (None, 126, 126, 32)      128
_________________________________________________________________
max_pooling2d_1 (MaxPooling2 (None, 63, 63, 32)        0
_________________________________________________________________
dropout_1 (Dropout)          (None, 63, 63, 32)        0
_________________________________________________________________
conv2d_2 (Conv2D)            (None, 61, 61, 32)        9248
_________________________________________________________________
batch_normalization_2 (Batch (None, 61, 61, 32)        128
_________________________________________________________________
max_pooling2d_2 (MaxPooling2 (None, 30, 30, 32)        0
_________________________________________________________________
dropout_2 (Dropout)          (None, 30, 30, 32)        0
_________________________________________________________________
flatten_1 (Flatten)          (None, 28800)             0
_________________________________________________________________
dense_1 (Dense)              (None, 256)               7373056
_________________________________________________________________
dropout_3 (Dropout)          (None, 256)               0
_________________________________________________________________
dense_2 (Dense)              (None, 256)               65792
_________________________________________________________________
dropout_4 (Dropout)          (None, 256)               0
_________________________________________________________________
batch_normalization_3 (Batch (None, 256)               1024
_________________________________________________________________
dropout_5 (Dropout)          (None, 256)               0
```

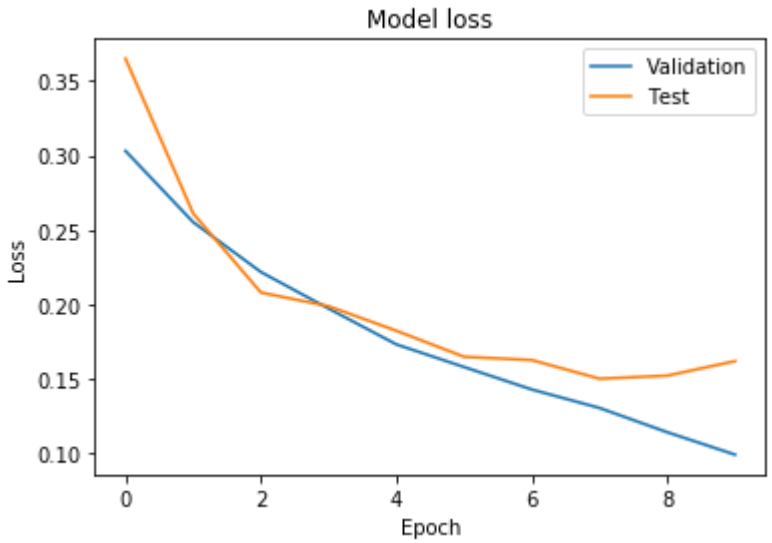
```
_________________________________________________________________
dense_3 (Dense)              (None, 2)                 514       
=================================================================
Total params: 7,450,786
Trainable params: 7,450,146
Non-trainable params: 640
_________________________________________________________________
None
```

In [9]:
```
history = model.fit(x_train, y_train, epochs=10, batch_size=500, verbose=1,valida
```

```
WARNING:tensorflow:From C:\Users\Vee\Anaconda3\lib\site-packages\keras\backend
\tensorflow_backend.py:422: The name tf.global_variables is deprecated. Please
use tf.compat.v1.global_variables instead.

Train on 20000 samples, validate on 5000 samples
Epoch 1/10
20000/20000 [==============================] - 13s 667us/step - loss: 0.3030 -
val_loss: 0.3650
Epoch 2/10
20000/20000 [==============================] - 10s 511us/step - loss: 0.2551 -
val_loss: 0.2610
Epoch 3/10
20000/20000 [==============================] - 10s 512us/step - loss: 0.2216 -
val_loss: 0.2079
Epoch 4/10
20000/20000 [==============================] - 10s 523us/step - loss: 0.1971 -
val_loss: 0.1987
Epoch 5/10
20000/20000 [==============================] - 11s 535us/step - loss: 0.1730 -
val_loss: 0.1822
Epoch 6/10
20000/20000 [==============================] - 11s 526us/step - loss: 0.1578 -
val_loss: 0.1647
Epoch 7/10
20000/20000 [==============================] - 10s 522us/step - loss: 0.1428 -
val_loss: 0.1625
Epoch 8/10
20000/20000 [==============================] - 10s 520us/step - loss: 0.1303 -
val_loss: 0.1500
Epoch 9/10
20000/20000 [==============================] - 10s 519us/step - loss: 0.1141 -
val_loss: 0.1521
Epoch 10/10
20000/20000 [==============================] - 10s 522us/step - loss: 0.0990 -
val_loss: 0.1618
```

In [10]:
```
# Plot training & validation loss values
plt.plot(history.history['loss'])
plt.plot(history.history['val_loss'])
plt.title('Model loss')
plt.ylabel('Loss')
plt.xlabel('Epoch')
plt.legend(['Validation', 'Test'], loc='upper right')
plt.show()
```



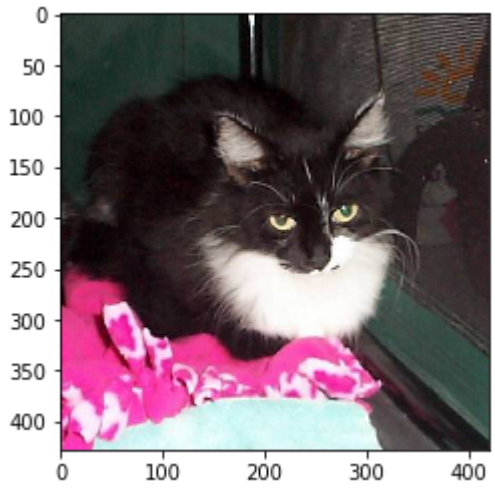

```
RANDOMIZED TRIAL OF 12 IMAGES
The tweleve images were truly random from a folder containing 12500 images of
cats and dogs that the network wasn't trained on
(check the number in which the cells are run, the twelve blocks are executed
sequentially so no running multiple times until I get the right classification)
```

In [92]:
```
randy = randrange(12500)
path = os.path.join(r'D:\Downloads\test1\test1', str(randy)+'.jpg')
img = Image.open(path)
x = np.array(img.resize((128,128)))
x = x.reshape(1,128,128,3)
answ = model.predict_on_batch(x)
classification = np.where(answ == np.amax(answ))[1][0]
imshow(img)
print(str(answ[0][classification]*100) + '% Confidence This Is A ' + names(class
```

```
55.16189932823181% Confidence This Is A Cat
```

In [93]:
```
randy = randrange(12500)
path = os.path.join(r'D:\Downloads\test1\test1', str(randy)+'.jpg')
img = Image.open(path)
x = np.array(img.resize((128,128)))
x = x.reshape(1,128,128,3)
answ = model.predict_on_batch(x)
classification = np.where(answ == np.amax(answ))[1][0]
imshow(img)
print(str(answ[0][classification]*100) + '% Confidence This Is A ' + names(class
```

```
96.3721513748169% Confidence This Is A Cat
```



In [94]:
```
randy = randrange(12500)
path = os.path.join(r'D:\Downloads\test1\test1', str(randy)+'.jpg')
img = Image.open(path)
x = np.array(img.resize((128,128)))
x = x.reshape(1,128,128,3)
answ = model.predict_on_batch(x)
classification = np.where(answ == np.amax(answ))[1][0]
imshow(img)
print(str(answ[0][classification]*100) + '% Confidence This Is A ' + names(class
```

```
98.34328889846802% Confidence This Is A Cat
```

In [95]:
```
randy = randrange(12500)
path = os.path.join(r'D:\Downloads\test1\test1', str(randy)+'.jpg')
img = Image.open(path)
x = np.array(img.resize((128,128)))
x = x.reshape(1,128,128,3)
answ = model.predict_on_batch(x)
classification = np.where(answ == np.amax(answ))[1][0]
imshow(img)
print(str(answ[0][classification]*100) + '% Confidence This Is A ' + names(class
```

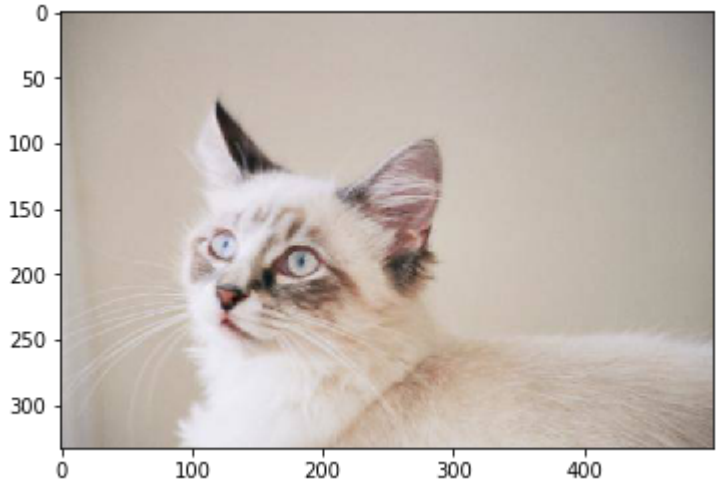
```
99.08443093299866% Confidence This Is A Cat
```

In [96]:
```
randy = randrange(12500)
path = os.path.join(r'D:\Downloads\test1\test1', str(randy)+'.jpg')
img = Image.open(path)
x = np.array(img.resize((128,128)))
x = x.reshape(1,128,128,3)
answ = model.predict_on_batch(x)
classification = np.where(answ == np.amax(answ))[1][0]
imshow(img)
print(str(answ[0][classification]*100) + '% Confidence This Is A ' + names(class
```

```
88.59165906906128% Confidence This Is A Dog
```

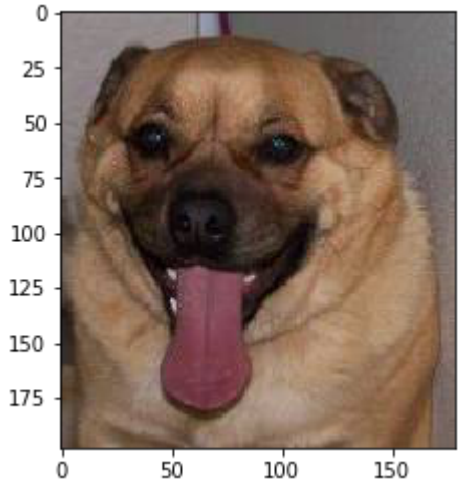
In [97]:
```
randy = randrange(12500)
path = os.path.join(r'D:\Downloads\test1\test1', str(randy)+'.jpg')
img = Image.open(path)
x = np.array(img.resize((128,128)))
x = x.reshape(1,128,128,3)
answ = model.predict_on_batch(x)
classification = np.where(answ == np.amax(answ))[1][0]
imshow(img)
print(str(answ[0][classification]*100) + '% Confidence This Is A ' + names(class
```

```
99.98745918273926% Confidence This Is A Cat
```



In [98]:
```
randy = randrange(12500)
path = os.path.join(r'D:\Downloads\test1\test1', str(randy)+'.jpg')
img = Image.open(path)
x = np.array(img.resize((128,128)))
x = x.reshape(1,128,128,3)
answ = model.predict_on_batch(x)
classification = np.where(answ == np.amax(answ))[1][0]
imshow(img)
print(str(answ[0][classification]*100) + '% Confidence This Is A ' + names(class
```

```
73.4760582447052% Confidence This Is A Dog
```



In [99]:
```
randy = randrange(12500)
path = os.path.join(r'D:\Downloads\test1\test1', str(randy)+'.jpg')
img = Image.open(path)
x = np.array(img.resize((128,128)))
x = x.reshape(1,128,128,3)
answ = model.predict_on_batch(x)
classification = np.where(answ == np.amax(answ))[1][0]
imshow(img)
print(str(answ[0][classification]*100) + '% Confidence This Is A ' + names(class
```

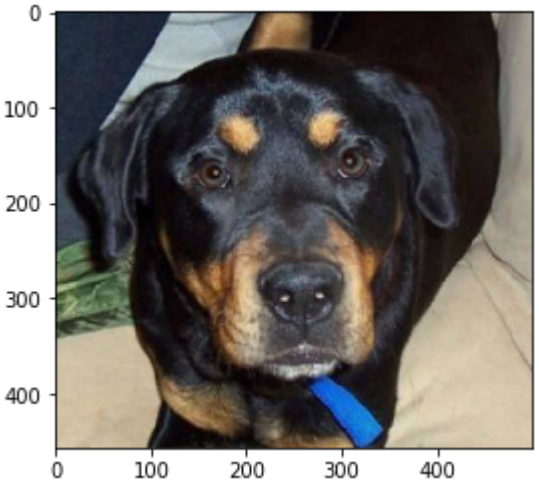
```
99.75565671920776% Confidence This Is A Cat
```

In [100]:
```
randy = randrange(12500)
path = os.path.join(r'D:\Downloads\test1\test1', str(randy)+'.jpg')
img = Image.open(path)
x = np.array(img.resize((128,128)))
x = x.reshape(1,128,128,3)
answ = model.predict_on_batch(x)
classification = np.where(answ == np.amax(answ))[1][0]
imshow(img)
print(str(answ[0][classification]*100) + '% Confidence This Is A ' + names(class
```

```
99.39665794372559% Confidence This Is A Dog
```

In [101]:
```
randy = randrange(12500)
path = os.path.join(r'D:\Downloads\test1\test1', str(randy)+'.jpg')
img = Image.open(path)
x = np.array(img.resize((128,128)))
x = x.reshape(1,128,128,3)
answ = model.predict_on_batch(x)
classification = np.where(answ == np.amax(answ))[1][0]
imshow(img)
print(str(answ[0][classification]*100) + '% Confidence This Is A ' + names(class
```

```
96.82347774505615% Confidence This Is A Dog
```



In [102]:
```
randy = randrange(12500)
path = os.path.join(r'D:\Downloads\test1\test1', str(randy)+'.jpg')
img = Image.open(path)
x = np.array(img.resize((128,128)))
x = x.reshape(1,128,128,3)
answ = model.predict_on_batch(x)
classification = np.where(answ == np.amax(answ))[1][0]
imshow(img)
print(str(answ[0][classification]*100) + '% Confidence This Is A ' + names(class
```

```
78.01265716552734% Confidence This Is A Cat
```

In [103]:
```
randy = randrange(12500)
path = os.path.join(r'D:\Downloads\test1\test1', str(randy)+'.jpg')
img = Image.open(path)
x = np.array(img.resize((128,128)))
x = x.reshape(1,128,128,3)
answ = model.predict_on_batch(x)
classification = np.where(answ == np.amax(answ))[1][0]
imshow(img)
print(str(answ[0][classification]*100) + '% Confidence This Is A ' + names(class
```

```
96.96904420852661% Confidence This Is A Dog
```