In [1]:
```
#imports
import numpy as np
import matplotlib.pyplot as plt
from numpy.random import multivariate_normal as N
np.random.seed(42)
```

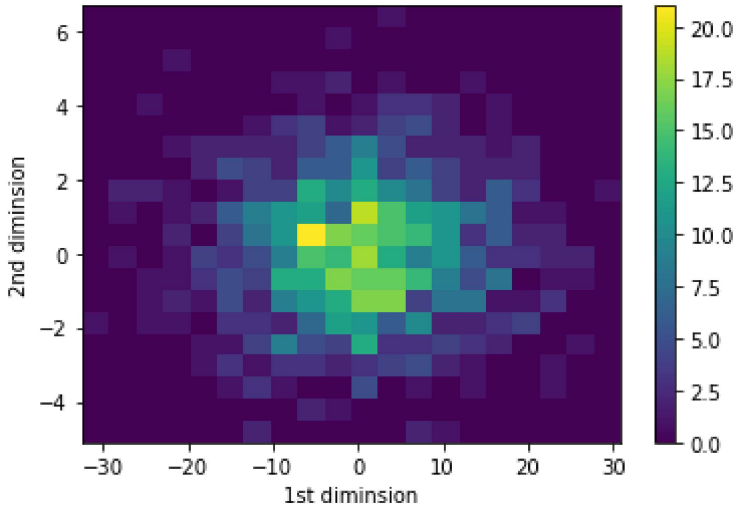
Create normal distributions

In [2]:
```
#create normal distributions
#X1 = N1
N1 = N([0,0], [[100,0],[0,3]], size=1000)
X1 = N1

#X2 = N1 + N2
N1 = N([0,0], [[100,0],[0,3]], size=500)
N2 = N([0,6], [[100,0],[0,3]], size=500)
X2 = np.concatenate((N1 , N2))

#X3 = N1 + N2 + N3
N1 = N([0,0], [[100,0],[0,3]], size=333)
N2 = N([0,6], [[100,0],[0,3]], size=333)
N3 = N([0,12], [[100,0],[0,3]], size=334)
X3 = np.concatenate((N1 , N2 , N3))
```

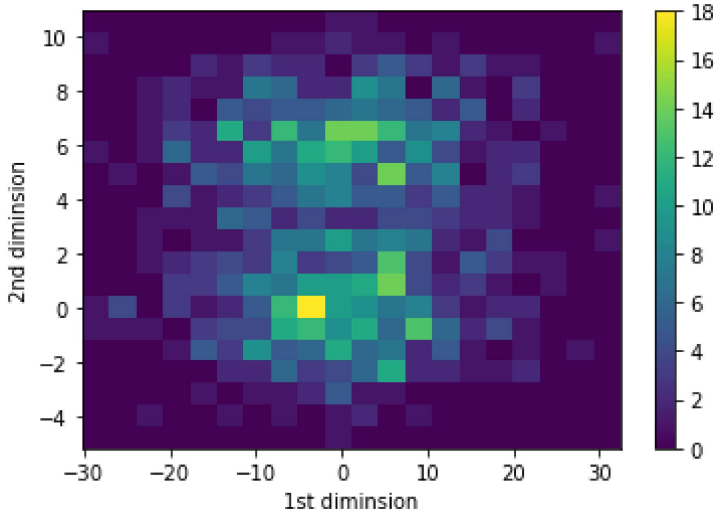
Plot distributions

In [3]:
```
def heatmap(X,bins=20):
    #returns a heatmap of the 2D distribution
    heatmap, xedges, yedges = np.histogram2d(X[:,0], X[:,1], bins=bins)
    extent = [xedges[0], xedges[-1], yedges[0], yedges[-1]]
    plt.xlabel('1st diminsion')
    plt.ylabel('2nd diminsion')
    plt.imshow(heatmap.T, extent=extent, origin='lower', aspect="auto")
    plt.colorbar()
```

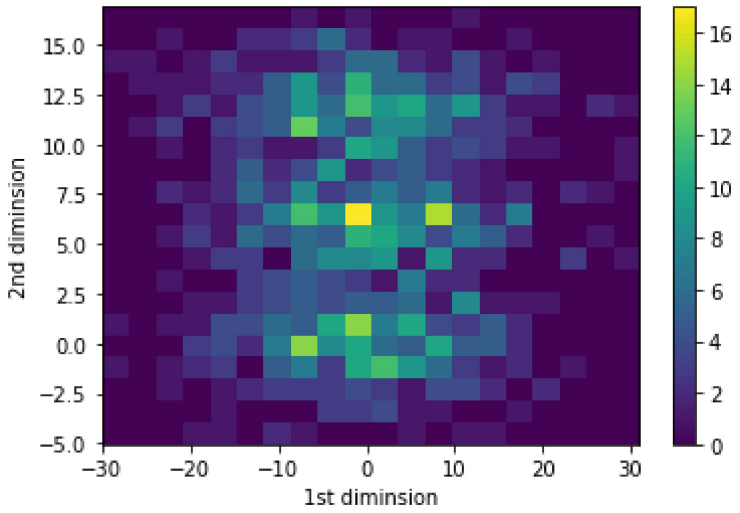
In [4]:
```
heatmap(X1)
```



In [5]:
```
heatmap(X2)
```



In [6]:
```
heatmap(X3)
```

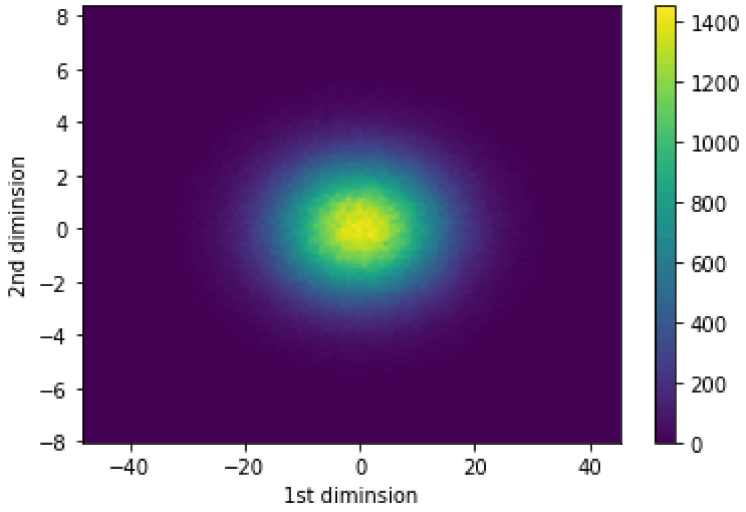


Plot distributions with more samples

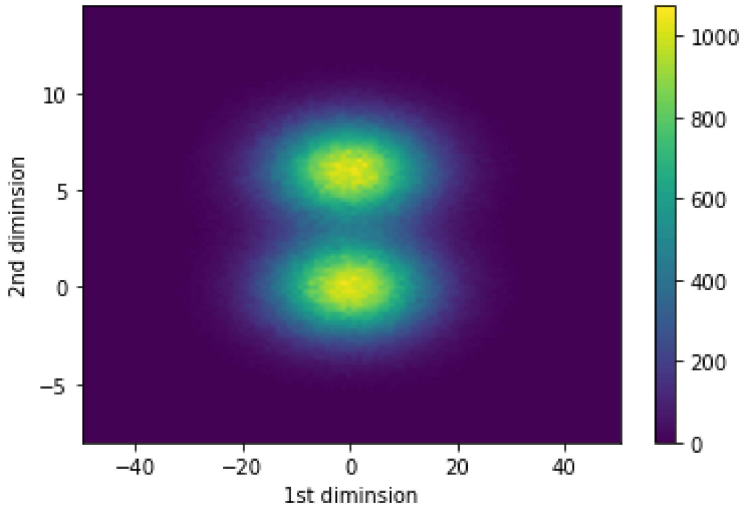
to have a more clear image of the shape of the distributions.

In [7]:
```
#recreate normal distributions with more samples
#X1 = N1
N1 = N([0,0], [[100,0],[0,3]], size=1000000)
X1_ = N1

#X2 = N1 + N2
N1 = N([0,0], [[100,0],[0,3]], size=500000)
N2 = N([0,6], [[100,0],[0,3]], size=500000)
X2_ = np.concatenate((N1 , N2))

#X3 = N1 + N2 + N3
N1 = N([0,0], [[100,0],[0,3]], size=333333)
N2 = N([0,6], [[100,0],[0,3]], size=333333)
N3 = N([0,12], [[100,0],[0,3]], size=333334)
X3_ = np.concatenate((N1 , N2 , N3))
```

In [8]:
```
heatmap(X1_,bins=100)
```



In [9]:
```
heatmap(X2_,bins=100)
```



In [10]:
```
heatmap(X3_,bins=100)
```