In [3]:

```python
import numpy as np
import scipy.sparse as sparse
import scipy.linalg as sla
import scipy.sparse.linalg as spla
import matplotlib.pyplot as plt
%matplotlib inline
```

Let's make a *random* sparse matrix

First we'll set the density so that

$$density = \frac{nnz(A)}{n^2}$$

In [4]:

```python
n = 100
density = 10.0 / n # 5 points per row
nnz = int(n*n*density)
```

Now make the entries:

In [5]:

```python
def randsp(n, density):
    nnz = int(n*n*density)
    row = np.random.random_integers(low=0, high=n-1, size=nnz)
    col = np.random.random_integers(low=0, high=n-1, size=nnz)
    data = np.ones(nnz, dtype=float)

    A = sparse.coo_matrix((data, (row, col)), shape=(n, n))
    return A
```
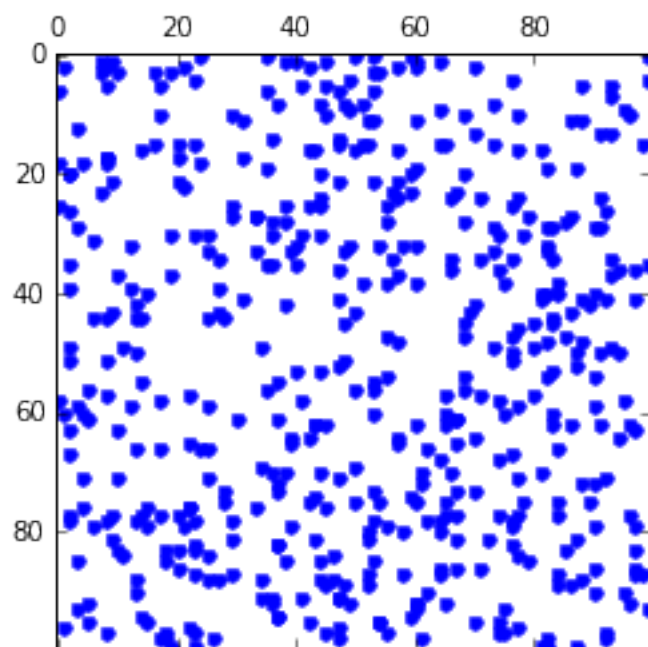
But let's make it positive definite:

In [7]:

```
A = randsp(100, 5/100.)
plt.spy(A, marker='.')
```
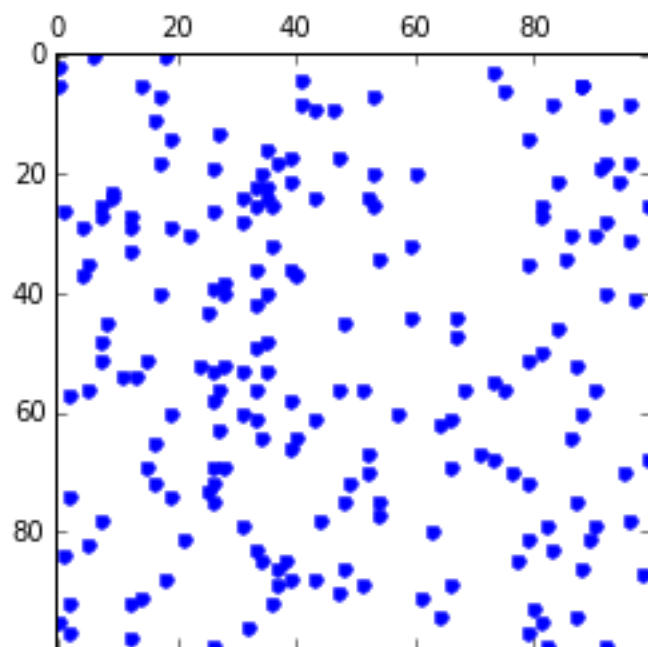
Out[7]:

```
<matplotlib.lines.Line2D at 0x111658940>
```


In [8]:

```
A = randsp(100, 2/100.)
plt.spy(A, marker='.')
```
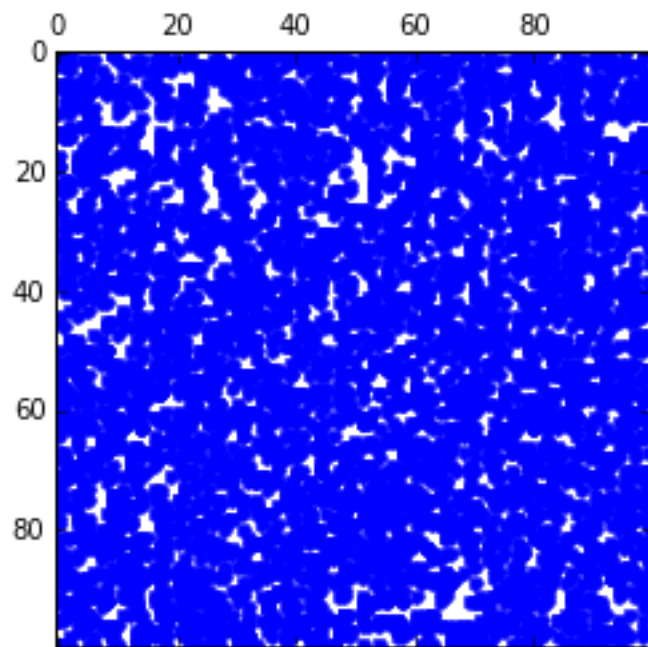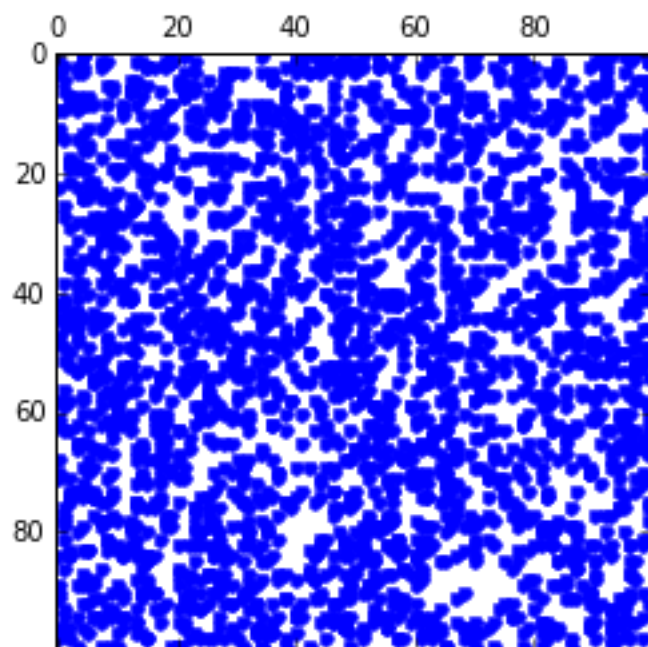
Out[8]:

```
<matplotlib.lines.Line2D at 0x1117004a8>
```

```
In [9]:
```

```
A = randsp(100, 50/100.)
plt.spy(A, marker='.')
```

```
Out[9]:
```

```
<matplotlib.lines.Line2D at 0x11171f8d0>
```



```
In [10]:
```

```
A = randsp(100, 25/100.)
plt.spy(A, marker='.')
```

```
Out[10]:
```

```
<matplotlib.lines.Line2D at 0x11183e518>
```



```
In [ ]:
```