In [ ]:
```
"""
- Reinforces techniques to read in data
- Introduces GroupBy
- Introduces Data Viz
"""
```

In [19]:
```
%matplotlib inline

import matplotlib
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
```

In [13]:
```
# Reading CSV with Pandas is super easy
chicago = pd.read_csv('data/chicago-salaries.csv')
chicago.head()
```

Out[13]:

	Name	Position Title	Department	Employee Annual Salary
0	AARON, ELVIA J	WATER RATE TAKER	WATER MGMNT	$88968.00
1	AARON, JEFFERY M	POLICE OFFICER	POLICE	$80778.00
2	AARON, KARINA	POLICE OFFICER	POLICE	$80778.00
3	AARON, KIMBERLEI R	CHIEF CONTRACT EXPEDITER	GENERAL SERVICES	$84780.00
4	ABAD JR, VICENTE M	CIVIL ENGINEER IV	WATER MGMNT	$104736.00

In [14]:
```
# We can use a subset of the columns
no_title = pd.read_csv('data/chicago-salaries.csv', usecols=['Name', 'Departı
no_title.head()
```

Out[14]:

	Name	Department	Employee Annual Salary
0	AARON, ELVIA J	WATER MGMNT	$88968.00
1	AARON, JEFFERY M	POLICE	$80778.00
2	AARON, KARINA	POLICE	$80778.00
3	AARON, KIMBERLEI R	GENERAL SERVICES	$84780.00
4	ABAD JR, VICENTE M	WATER MGMNT	$104736.00

In [15]:
```
# We can use different column names
# Specify index of header row to replace them with our names
our_column_names = pd.read_csv('data/chicago-salaries.csv', header=0, names=
our_column_names.head()
```

Out[15]:

	name	title	department	salary
0	AARON, ELVIA J	WATER RATE TAKER	WATER MGMNT	$88968.00
1	AARON, JEFFERY M	POLICE OFFICER	POLICE	$80778.00
2	AARON, KARINA	POLICE OFFICER	POLICE	$80778.00
3	AARON, KIMBERLEI R	CHIEF CONTRACT EXPEDITER	GENERAL SERVICES	$84780.00
4	ABAD JR, VICENTE M	CIVIL ENGINEER IV	WATER MGMNT	$104736.00

In [16]:
```
# Or we could both use a subset of columns and rename them
no_title = pd.read_csv('data/chicago-salaries.csv', usecols=['Name', 'Departm
both = no_title.rename(columns={'Name': 'name', 'Department': 'dept', 'Employ
both.head()
```

Out[16]:

	name	dept	salary
0	AARON, ELVIA J	WATER MGMNT	$88968.00
1	AARON, JEFFERY M	POLICE	$80778.00
2	AARON, KARINA	POLICE	$80778.00
3	AARON, KIMBERLEI R	GENERAL SERVICES	$84780.00
4	ABAD JR, VICENTE M	WATER MGMNT	$104736.00

In [20]:
```
# We can also pass converters on columns
converted = pd.read_csv(
    'data/chicago-salaries.csv',
    converters={
        'Employee Annual Salary': lambda x: float(x.replace('$', ''))
    })
chicago = converted.rename(columns={'Name': 'name', 'Position Title': 'title
chicago.head()
```

Out[20]:

	name	title	dept	salary
0	AARON, ELVIA J	WATER RATE TAKER	WATER MGMNT	88968
1	AARON, JEFFERY M	POLICE OFFICER	POLICE	80778
2	AARON, KARINA	POLICE OFFICER	POLICE	80778
3	AARON, KIMBERLEI R	CHIEF CONTRACT EXPEDITER	GENERAL SERVICES	84780
4	ABAD JR, VICENTE M	CIVIL ENGINEER IV	WATER MGMNT	104736

In [21]:
```
# Remember the tally method? Pandas makes it easy
chicago['dept'].value_counts()
```

Out[21]:
```
POLICE                  13570
FIRE                     4875
STREETS & SAN            2090
WATER MGMNT              1848
AVIATION                 1344
TRANSPORTN               1200
OEMC                     1135
PUBLIC LIBRARY            951
GENERAL SERVICES          924
FAMILY & SUPPORT          679
FINANCE                   560
HEALTH                    555
LAW                       425
CITY COUNCIL              397
BUILDINGS                 257
COMMUNITY DEVELOPMENT     212
BUSINESS AFFAIRS          173
BOARD OF ELECTION         111
DoIT                      106
MAYOR'S OFFICE             93
IPRA                       83
CITY CLERK                 82
PROCUREMENT                81
CULTURAL AFFAIRS           79
HUMAN RESOURCES            68
ANIMAL CONTRL              67
INSPECTOR GEN              54
BUDGET & MGMT              43
ADMIN HEARNG               39
DISABILITIES               27
TREASURER                  24
HUMAN RELATIONS            17
BOARD OF ETHICS             9
POLICE BOARD                2
LICENSE APPL COMM           1
dtype: int64
```

In [22]:
```
chicago.ix[0]
```

Out[22]:
```
name       AARON,  ELVIA J
title     WATER RATE TAKER
dept           WATER MGMNT
salary               88968
Name: 0, dtype: object
```

In [23]:
```
# Get number of distinct title within each department
chicago.groupby('dept').apply(lambda df: len(set(df['title'])))
```

Out[23]:
```
dept
ADMIN HEARNG              15
ANIMAL CONTRL             17
AVIATION                 123
BOARD OF ELECTION         25
BOARD OF ETHICS            9
BUDGET & MGMT             24
BUILDINGS                 50
BUSINESS AFFAIRS          62
CITY CLERK                37
CITY COUNCIL              28
COMMUNITY DEVELOPMENT     70
CULTURAL AFFAIRS          39
DISABILITIES              20
DoIT                      41
FAMILY & SUPPORT          99
FINANCE                  104
FIRE                      99
GENERAL SERVICES         119
HEALTH                   115
HUMAN RELATIONS           12
HUMAN RESOURCES           30
INSPECTOR GEN             28
IPRA                      22
LAW                       52
LICENSE APPL COMM          1
MAYOR'S OFFICE            29
OEMC                      70
POLICE                   129
POLICE BOARD               2
PROCUREMENT               30
PUBLIC LIBRARY            68
STREETS & SAN             70
TRANSPORTN               156
TREASURER                 16
WATER MGMNT              154
dtype: int64
```

In [25]:
```
# Sum of title lengths by dept
chicago.groupby('dept').apply(lambda df: df['title'].map(lambda title: len(t
```

Out[25]:
```
dept
ADMIN HEARNG                931
ANIMAL CONTRL              1500
AVIATION                  29052
BOARD OF ELECTION          2924
BOARD OF ETHICS             185
BUDGET & MGMT               921
BUILDINGS                  6294
BUSINESS AFFAIRS           3917
CITY CLERK                 1972
CITY COUNCIL               7515
COMMUNITY DEVELOPMENT      4567
CULTURAL AFFAIRS           1843
DISABILITIES                617
DoIT                       2637
FAMILY & SUPPORT          13727
FINANCE                   11357
FIRE                      74395
GENERAL SERVICES          19313
HEALTH                    13265
HUMAN RELATIONS             491
HUMAN RESOURCES            1435
INSPECTOR GEN              1222
IPRA                       1884
LAW                        9239
LICENSE APPL COMM            10
MAYOR'S OFFICE             1941
OEMC                      32690
POLICE                   216020
POLICE BOARD                 45
PROCUREMENT                2022
PUBLIC LIBRARY            15079
STREETS & SAN             40932
TRANSPORTN                21856
TREASURER                   422
WATER MGMNT               36369
dtype: int64
```

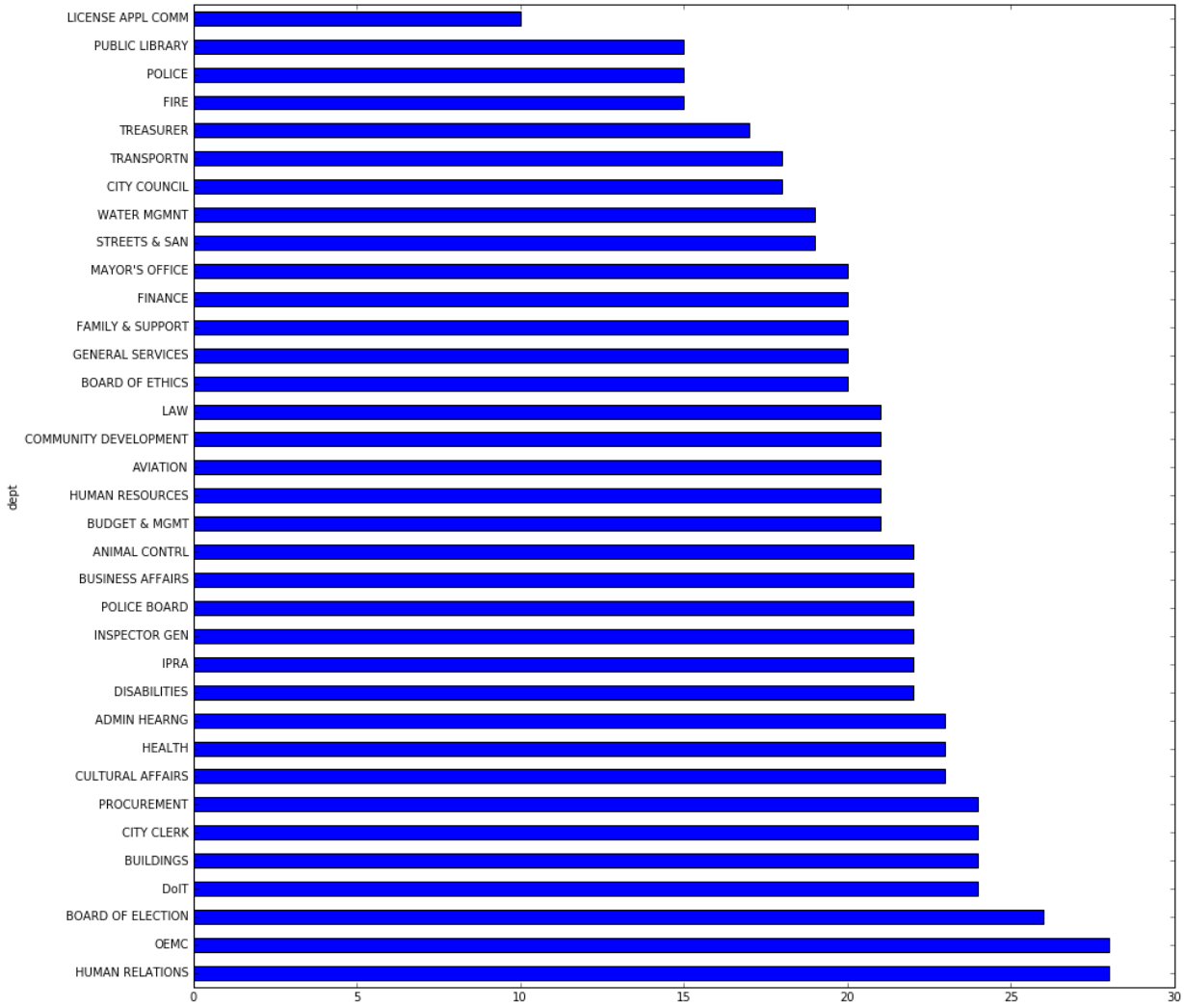
In [26]:
```
chicago['title'].map(lambda title: len(title)).sum() / len(chicago)
```

Out[26]:
```
17
```

In [30]:
```
def get_average_title_length(group):
    return group.title.map(lambda x: len(x)).sum() / len(group)

# Average title length by department
title_length_by_dept = chicago.groupby('dept').apply(get_average_title_lengt
title_length_by_dept.plot(kind='barh', figsize(15, 15))
```

Out[30]: <matplotlib.axes._subplots.AxesSubplot at 0x109ba8b90>

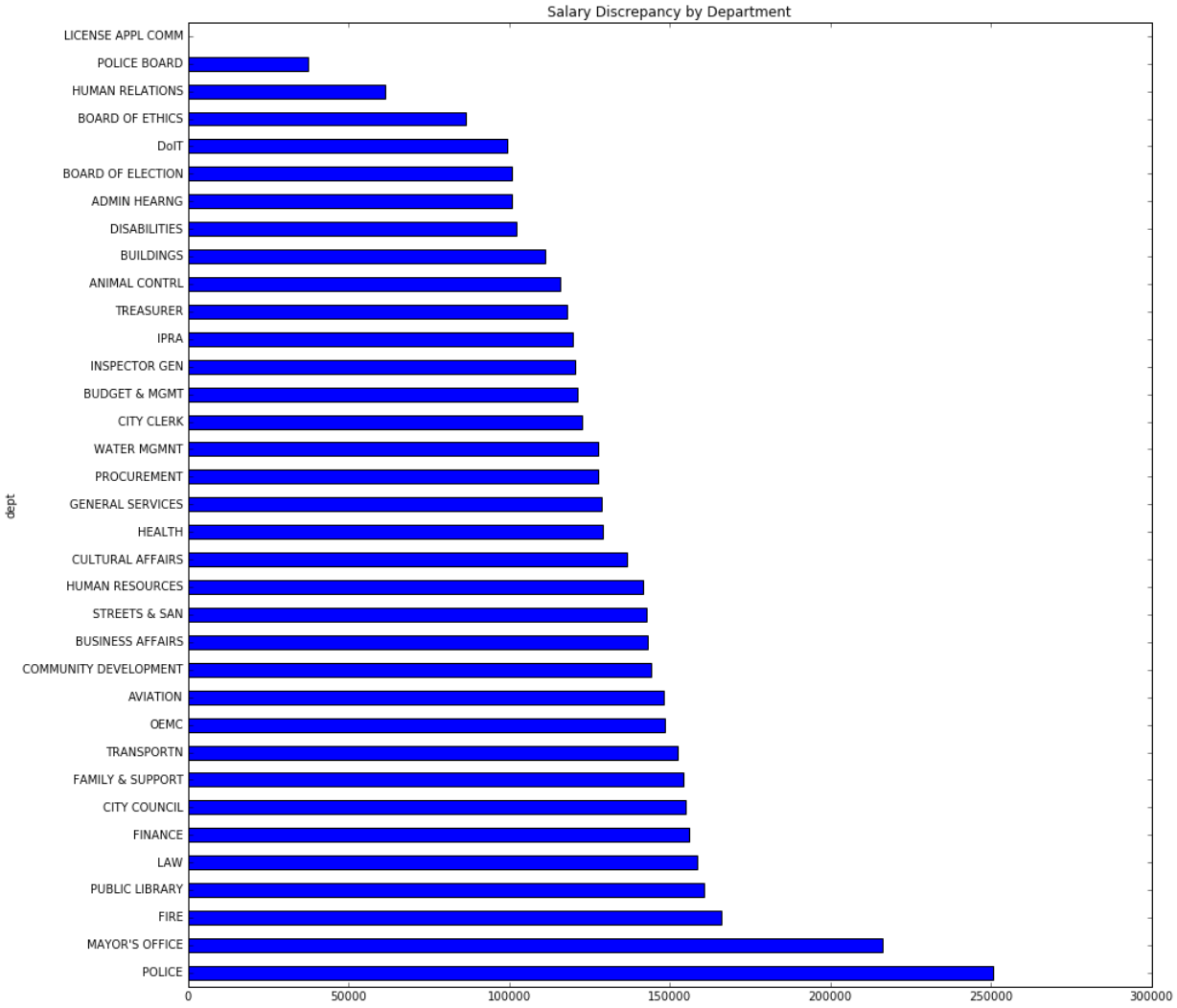


In [41]:
```
# Greatest salary discrepancy by dept
sorted_diffs = chicago.groupby('dept').apply(lambda df: df['salary'].max() -
sorted_diffs.sort(ascending=False)
sorted_diffs.head()
```

Out[41]:
```
dept
POLICE            250644.00
MAYOR'S OFFICE    216209.04
FIRE              166212.00
PUBLIC LIBRARY    160800.40
LAW               158649.00
dtype: float64
```

In [35]:
```
sorted_diffs.plot(kind='barh', figsize=(15,15), title="Salary Discrepancy by
```

Out[35]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x10b110b10>
```



In [44]:
```
# Lets look closer on the police department
police_salaries = chicago[chicago['dept'] == 'POLICE'].sort('salary')
police_salaries.head()
```

Out[44]:

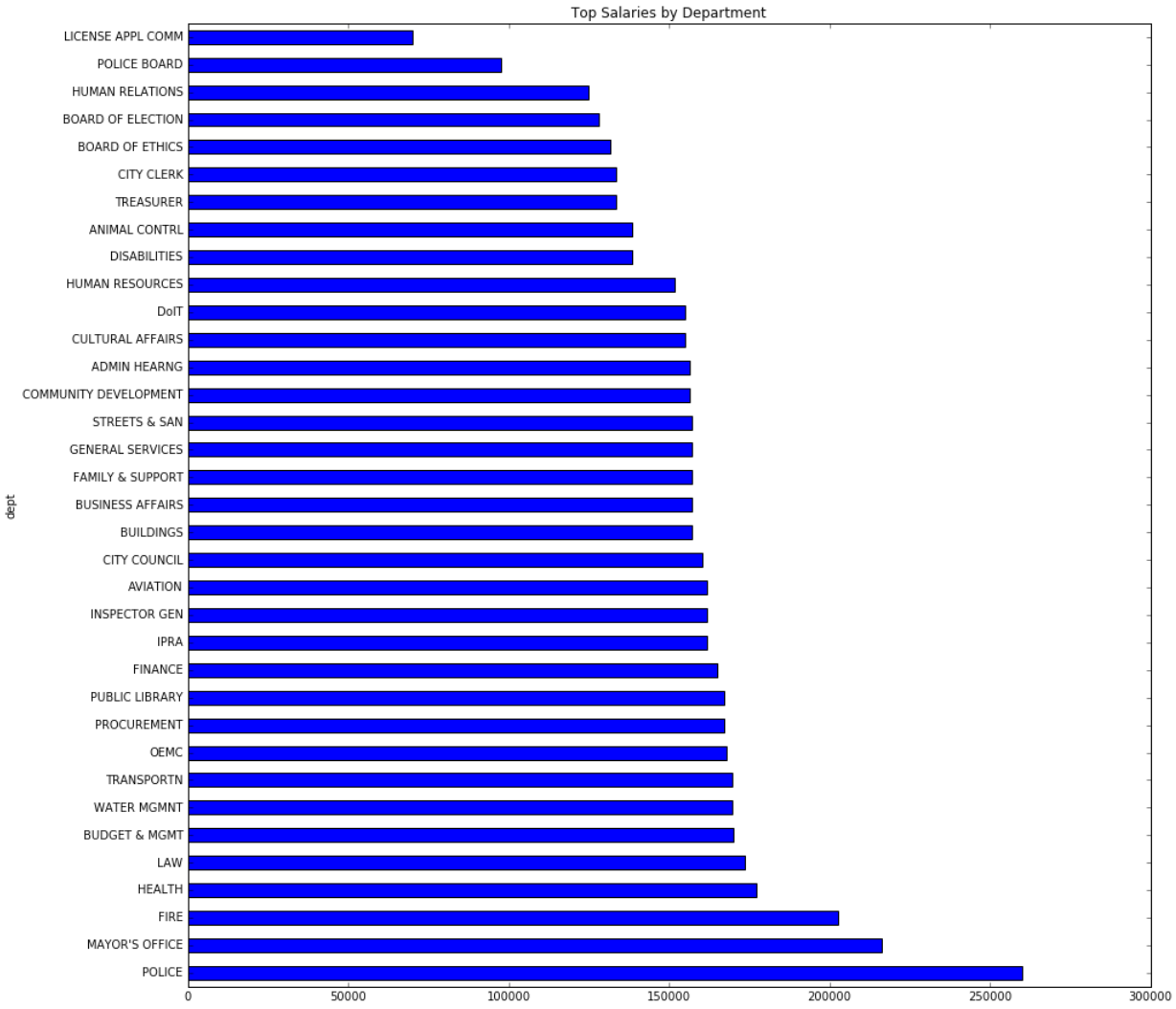
	name	title	dept	salary
25816	SCHELLS, SHAKALA D	POLICE CADET	POLICE	9360
30741	WHITE, JAHAZIEL J	PROGRAM AIDE	POLICE	9360
19521	MOORE, KEMON J	PROGRAM AIDE	POLICE	9360
5920	CRUMP, AUTUMN R	POLICE CADET	POLICE	9360
9658	GARDNER, KAWANDA D	PROGRAM AIDE	POLICE	9360

In [45]:
```
# What are the max salaries in each department?
max_salaries = chicago.groupby('dept').apply(lambda df: df['salary'].max()).s
max_salaries.head()
```

Out[45]:
```
dept
POLICE            260004
MAYOR'S OFFICE    216210
FIRE              202728
HEALTH            177000
LAW               173664
dtype: float64
```

In [38]:
```
max_salaries.plot(title="Top Salaries by Department", figsize=(15,15), kind=
```

Out[38]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x10b834a10>
```



In [40]:
```
max_salaries.describe()
```

Out[40]:
```
count        35.000000
mean     157353.942857
std       31279.788341
min       69888.000000
25%      144996.000000
50%      157092.000000
75%      167508.000000
max      260004.000000
dtype: float64
```

In [ ]:
```

```