In [45]:

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

%matplotlib inline
sb.set(style='ticks')
```

In [2]:

```
# Будем анализировать данные только на обучающей выборке
data = pd.read_csv('C:\\Users\\uivan_000\\Desktop\\athlete_events.csv', sep=",")
```

In [3]:

```
# Первые 5 строк датасета
data.head()
```

Out[3]:

	ID	Name	Sex	Age	Height	Weight	Team	NOC	Games	Year	Seaso
0	1	A Dijiang	M	24.0	180.0	80.0	China	CHN	1992 Summer	1992	Summe
1	2	A Lamusi	M	23.0	170.0	60.0	China	CHN	2012 Summer	2012	Summe
2	3	Gunnar Nielsen Aaby	M	24.0	NaN	NaN	Denmark	DEN	1920 Summer	1920	Summe
3	4	Edgar Lindenau Aabye	M	34.0	NaN	NaN	Denmark/Sweden	DEN	1900 Summer	1900	Summe
4	5	Christine Jacoba Aaftink	F	21.0	185.0	82.0	Netherlands	NED	1988 Winter	1988	Winte

In [4]:

```
# Размер датасета - 271116 строк, 15 колонок
data.shape
```

Out[4]:

```
(271116, 15)
```

In [5]:

```
total_count = data.shape[0]
print('Всего строк: {}'.format(total_count))
```

```
Всего строк: 271116
```

In [6]:

```
data.columns
```

Out[6]:

```
Index(['ID', 'Name', 'Sex', 'Age', 'Height', 'Weight', 'Team', 'NOC', 'Gam
es',
       'Year', 'Season', 'City', 'Sport', 'Event', 'Medal'],
      dtype='object')
```

In [7]:

```
data.dtypes
```

Out[7]:

```
ID          int64
Name       object
Sex        object
Age       float64
Height    float64
Weight    float64
Team       object
NOC        object
Games      object
Year        int64
Season     object
City       object
Sport      object
Event      object
Medal      object
dtype: object
```

In [8]:

```
#Проверим на пустые значения
for column in data.columns:
    temp_null_count = data[data[column].isnull()].shape[0]
    print('{} - {}'.format(column,temp_null_count))
```

```
ID - 0
Name - 0
Sex - 0
Age - 9474
Height - 60171
Weight - 62875
Team - 0
NOC - 0
Games - 0
Year - 0
Season - 0
City - 0
Sport - 0
Event - 0
Medal - 231333
```

In [9]:

```
#основные статические характеритсики набора данных
data.describe()
```

Out[9]:

	ID	Age	Height	Weight	Year
count	271116.000000	261642.000000	210945.000000	208241.000000	271116.000000
mean	68248.954396	25.556898	175.338970	70.702393	1978.378480
std	39022.286345	6.393561	10.518462	14.348020	29.877632
min	1.000000	10.000000	127.000000	25.000000	1896.000000
25%	34643.000000	21.000000	168.000000	60.000000	1960.000000
50%	68205.000000	24.000000	175.000000	70.000000	1988.000000
75%	102097.250000	28.000000	183.000000	79.000000	2002.000000
max	135571.000000	97.000000	226.000000	214.000000	2016.000000

In [10]:

```
# Определим уникальные значения для целевого признака
data['Season'].unique()
```

Out[10]:

```
array(['Summer', 'Winter'], dtype=object)
```

In [11]:

```
# Определим уникальные значения для целевого признака
data['Sport'].unique()
```

Out[11]:

```
array(['Basketball', 'Judo', 'Football', 'Tug-Of-War', 'Speed Skating',
       'Cross Country Skiing', 'Athletics', 'Ice Hockey', 'Swimming',
       'Badminton', 'Sailing', 'Biathlon', 'Gymnastics',
       'Art Competitions', 'Alpine Skiing', 'Handball', 'Weightlifting',
       'Wrestling', 'Luge', 'Water Polo', 'Hockey', 'Rowing', 'Bobsleigh',
       'Fencing', 'Equestrianism', 'Shooting', 'Boxing', 'Taekwondo',
       'Cycling', 'Diving', 'Canoeing', 'Tennis', 'Modern Pentathlon',
       'Figure Skating', 'Golf', 'Softball', 'Archery', 'Volleyball',
       'Synchronized Swimming', 'Table Tennis', 'Nordic Combined',
       'Baseball', 'Rhythmic Gymnastics', 'Freestyle Skiing',
       'Rugby Sevens', 'Trampolining', 'Beach Volleyball', 'Triathlon',
       'Ski Jumping', 'Curling', 'Snowboarding', 'Rugby',
       'Short Track Speed Skating', 'Skeleton', 'Lacrosse', 'Polo',
       'Cricket', 'Racquets', 'Motorboating', 'Military Ski Patrol',
       'Croquet', 'Jeu De Paume', 'Roque', 'Alpinism', 'Basque Pelota',
       'Aeronautics'], dtype=object)
```

In [12]:

```
# Определим уникальные значения для целевого признака
data['Sex'].unique()
```

Out[12]:

```
array(['M', 'F'], dtype=object)
```

In [13]:

```
# Определим уникальные значения для целевого признака
data['NOC'].unique()
```

Out[13]:

```
array(['CHN', 'DEN', 'NED', 'USA', 'FIN', 'NOR', 'ROU', 'EST', 'FRA',
       'MAR', 'ESP', 'EGY', 'IRI', 'BUL', 'ITA', 'CHA', 'AZE', 'SUD',
       'RUS', 'ARG', 'CUB', 'BLR', 'GRE', 'CMR', 'TUR', 'CHI', 'MEX',
       'URS', 'NCA', 'HUN', 'NGR', 'ALG', 'KUW', 'BRN', 'PAK', 'IRQ',
       'UAR', 'LIB', 'QAT', 'MAS', 'GER', 'CAN', 'IRL', 'AUS', 'RSA',
       'ERI', 'TAN', 'JOR', 'TUN', 'LBA', 'BEL', 'DJI', 'PLE', 'COM',
       'KAZ', 'BRU', 'IND', 'KSA', 'SYR', 'MDV', 'ETH', 'UAE', 'YAR',
       'INA', 'PHI', 'SGP', 'UZB', 'KGZ', 'TJK', 'EUN', 'JPN', 'CGO',
       'SUI', 'BRA', 'FRG', 'GDR', 'MON', 'ISR', 'URU', 'SWE', 'ISV',
       'SRI', 'ARM', 'CIV', 'KEN', 'BEN', 'UKR', 'GBR', 'GHA', 'SOM',
       'LAT', 'NIG', 'MLI', 'AFG', 'POL', 'CRC', 'PAN', 'GEO', 'SLO',
       'CRO', 'GUY', 'NZL', 'POR', 'PAR', 'ANG', 'VEN', 'COL', 'BAN',
       'PER', 'ESA', 'PUR', 'UGA', 'HON', 'ECU', 'TKM', 'MRI', 'SEY',
       'TCH', 'LUX', 'MTN', 'CZE', 'SKN', 'TTO', 'DOM', 'VIN', 'JAM',
       'LBR', 'SUR', 'NEP', 'MGL', 'AUT', 'PLW', 'LTU', 'TOG', 'NAM',
       'AHO', 'ISL', 'ASA', 'SAM', 'RWA', 'DMA', 'HAI', 'MLT', 'CYP',
       'GUI', 'BIZ', 'YMD', 'KOR', 'THA', 'BER', 'ANZ', 'SCG', 'SLE',
       'PNG', 'YEM', 'IOA', 'OMA', 'FIJ', 'VAN', 'MDA', 'YUG', 'BAH',
       'GUA', 'SRB', 'IVB', 'MOZ', 'CAF', 'MAD', 'MAL', 'BIH', 'GUM',
       'CAY', 'SVK', 'BAR', 'GBS', 'TLS', 'COD', 'GAB', 'SMR', 'LAO',
       'BOT', 'ROT', 'CAM', 'PRK', 'SOL', 'SEN', 'CPV', 'CRT', 'GEQ',
       'BOL', 'SAA', 'AND', 'ANT', 'ZIM', 'GRN', 'HKG', 'LCA', 'FSM',
       'MYA', 'MAW', 'ZAM', 'RHO', 'TPE', 'STP', 'MKD', 'BOH', 'TGA',
       'LIE', 'MNE', 'GAM', 'COK', 'ALB', 'WIF', 'SWZ', 'BUR', 'NBO',
       'BDI', 'ARU', 'NRU', 'VNM', 'VIE', 'BHU', 'MHL', 'KIR', 'UNK',
       'TUV', 'NFL', 'KOS', 'SSD', 'LES'], dtype=object)
```

In [14]:

```
# Определим уникальные значения для целевого признака
data['Medal'].unique()
```

Out[14]:

```
array([nan, 'Gold', 'Bronze', 'Silver'], dtype=object)
```

In [15]:

```
# Определим уникальные значения для целевого признака
data['Year'].unique()
```

Out[15]:

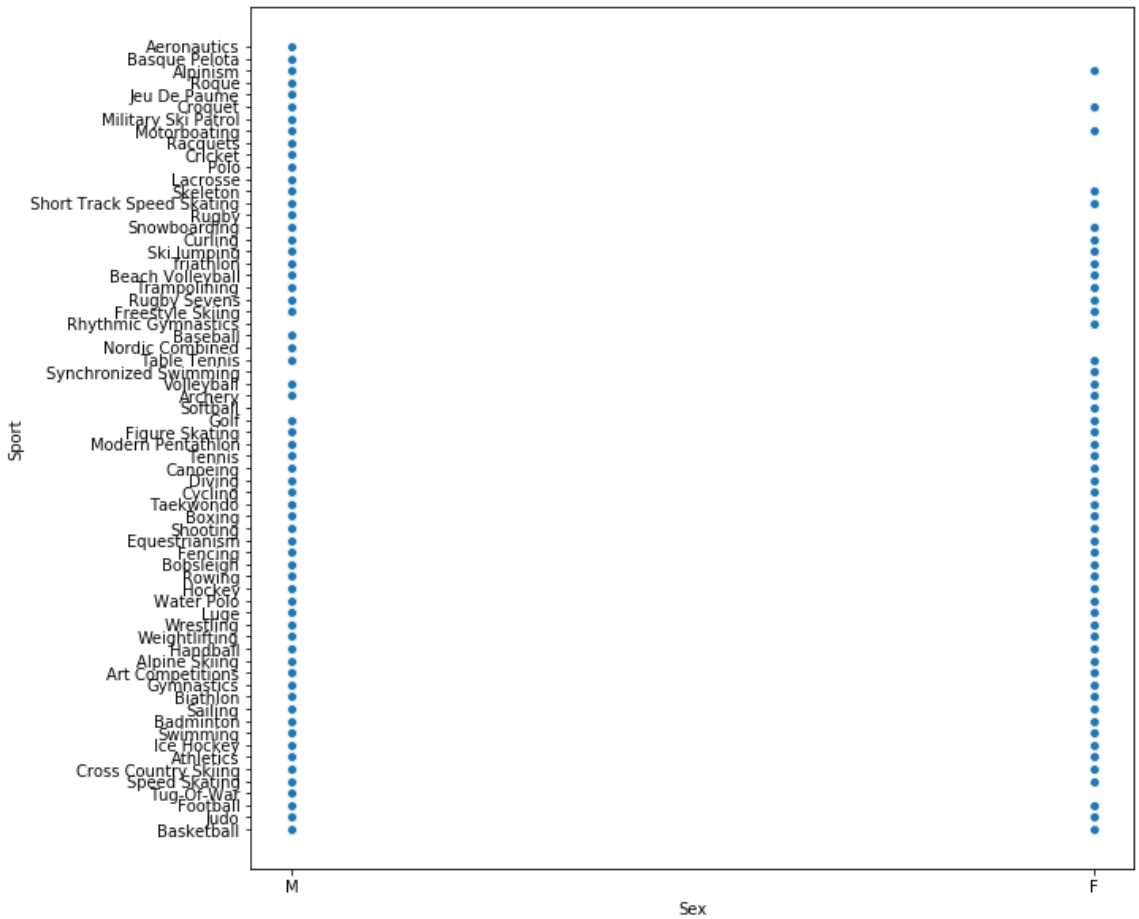
```
array([1992, 2012, 1920, 1900, 1988, 1994, 1932, 2002, 1952, 1980, 2000,
       1996, 1912, 1924, 2014, 1948, 1998, 2006, 2008, 2016, 2004, 1960,
       1964, 1984, 1968, 1972, 1936, 1956, 1928, 1976, 2010, 1906, 1904,
       1908, 1896], dtype=int64)
```

In [16]:

```
fig, ax = plt.subplots(figsize=(10,10))
sb.scatterplot(ax=ax, x='Sex', y='Sport', data=data)
```

Out[16]:

```
<matplotlib.axes._subplots.AxesSubplot at 0xceb7671f28>
```

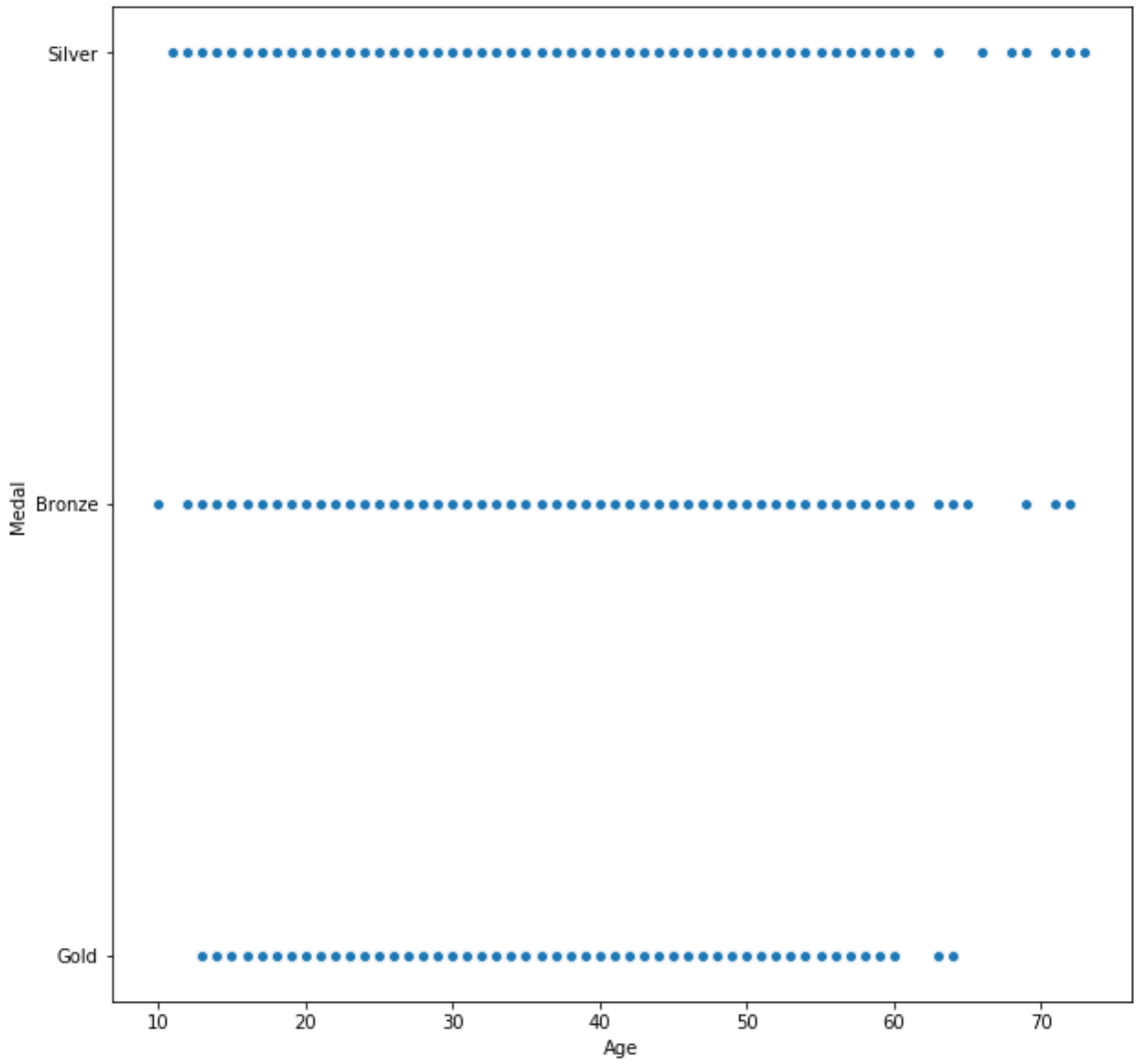


In [17]:

```
fig, ax = plt.subplots(figsize=(10,10))
sb.scatterplot(ax=ax, x='Age', y='Medal', data=data)
```

Out[17]:

```
<matplotlib.axes._subplots.AxesSubplot at 0xceb77b5518>
```



In [18]:

```
data['Age'].unique()
```

Out[18]:

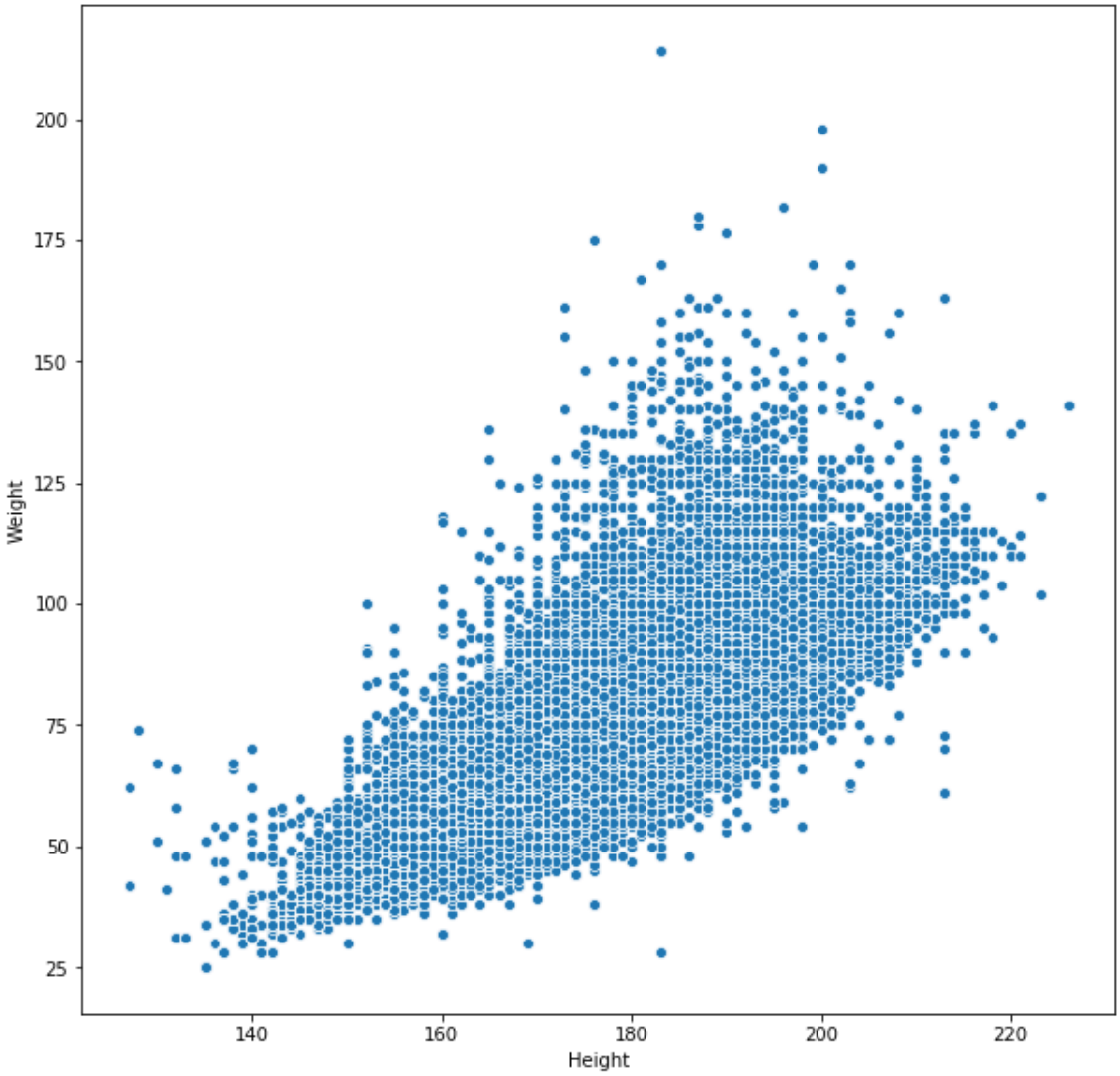
```
array([24., 23., 34., 21., 25., 27., 31., 33., 18., 26., 22., 30., 32.,
       28., 54., 20., 17., 43., 47., 29., 41., 45., 49., 53., 57., nan,
       19., 38., 35., 16., 37., 15., 42., 46., 40., 36., 14., 39., 48.,
       52., 44., 55., 50., 71., 63., 51., 58., 13., 60., 75., 65., 56.,
       64., 68., 84., 12., 72., 59., 61., 70., 74., 62., 67., 69., 73.,
       66., 11., 76., 88., 96., 80., 10., 81., 77., 97.])
```

In [19]:

```
fig, ax = plt.subplots(figsize=(10,10))
sb.scatterplot(ax=ax, x='Height', y='Weight', data=data)
```

Out[19]:

```
<matplotlib.axes._subplots.AxesSubplot at 0xceb785e2e8>
```

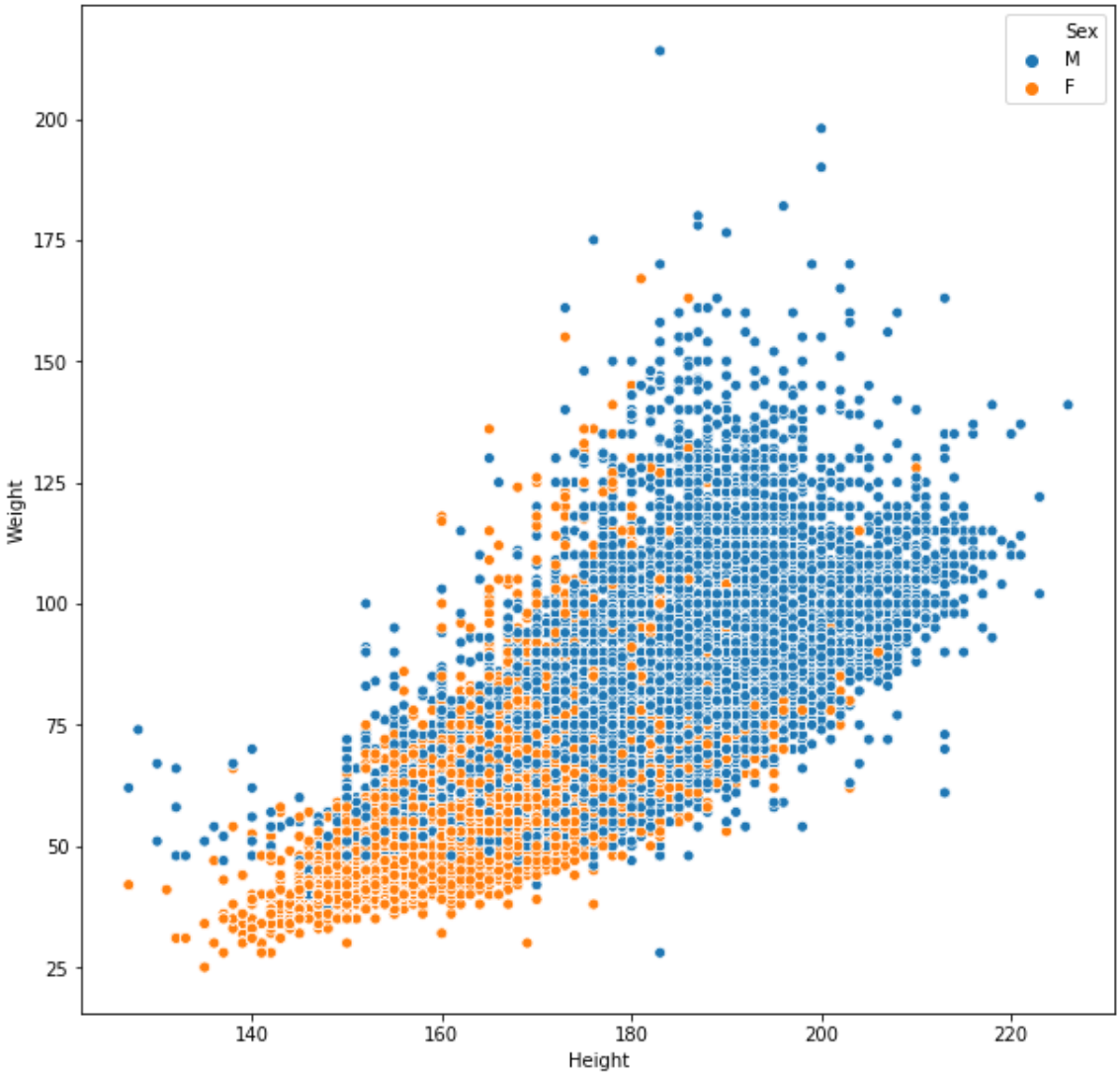


In [20]:

```
fig, ax = plt.subplots(figsize=(10,10))
sb.scatterplot(ax=ax, x='Height', y='Weight', data=data, hue='Sex')
```

Out[20]:

```
<matplotlib.axes._subplots.AxesSubplot at 0xceb7d06550>
```

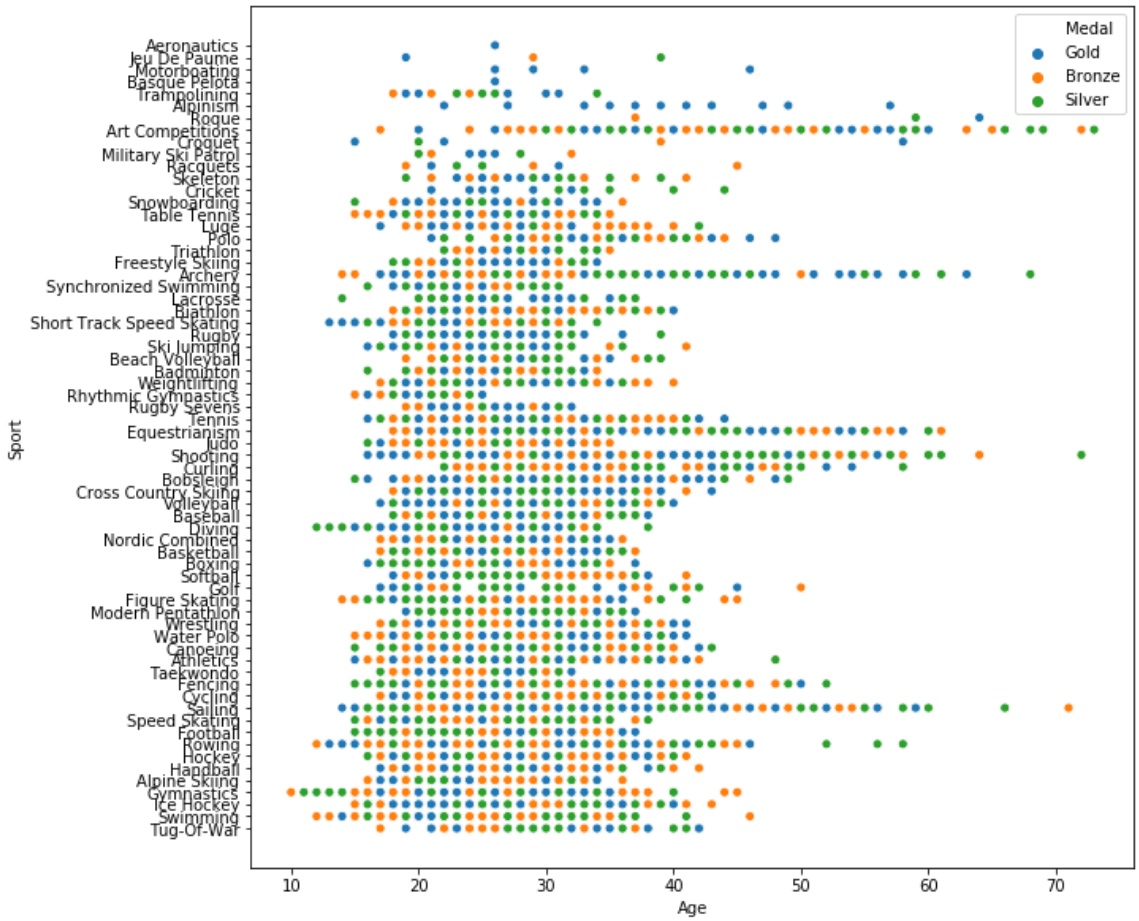


In [21]:

```
fig, ax = plt.subplots(figsize=(10,10))
sb.scatterplot(ax=ax, x='Age', y='Sport', data=data, hue='Medal')
```

Out[21]:

```
<matplotlib.axes._subplots.AxesSubplot at 0xcebb905710>
```



In [22]:

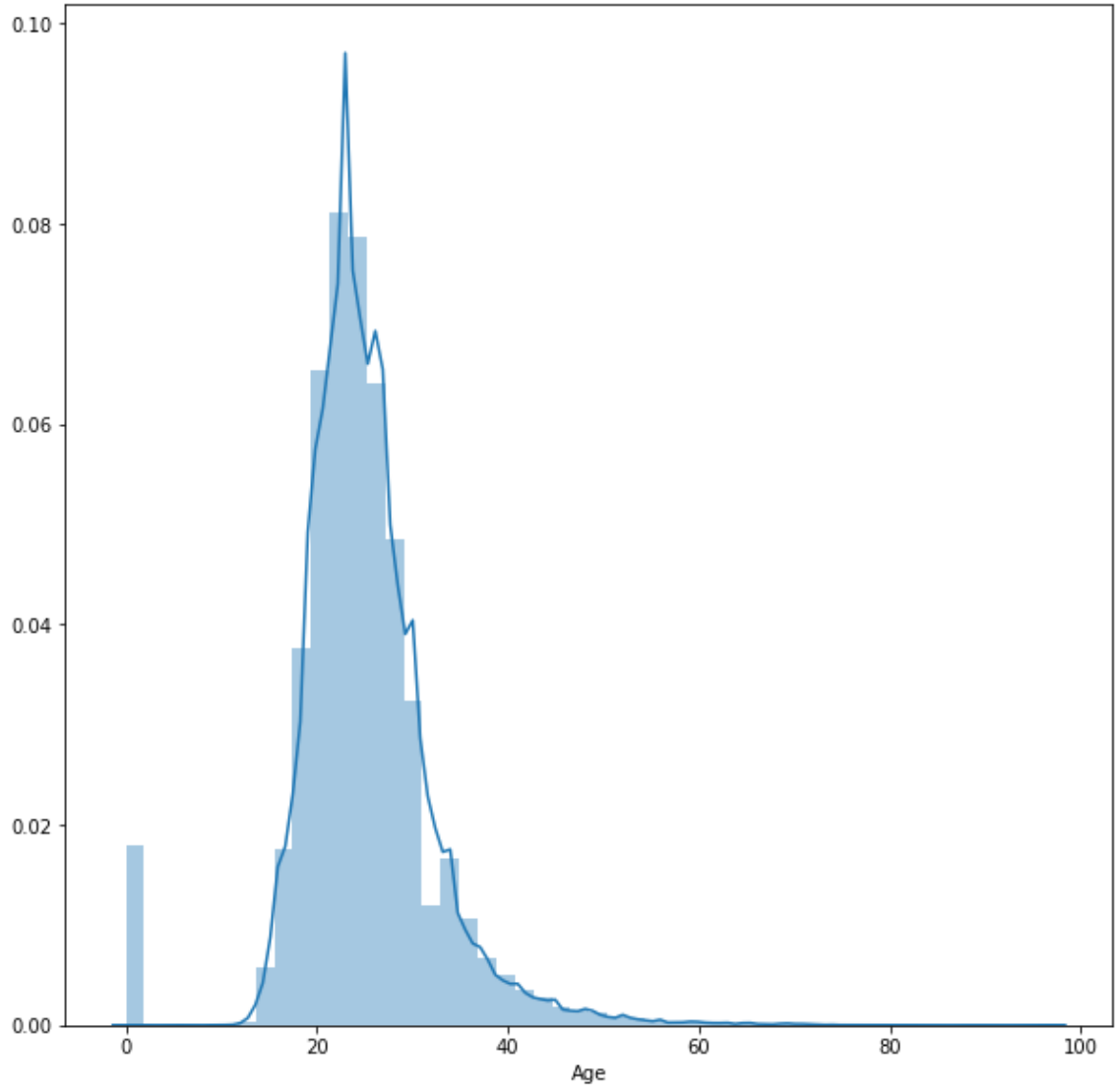
```
data=data.fillna(0)
```

In [23]:

```
fig, ax = plt.subplots(figsize=(10,10))
sb.distplot(data['Age'])
```

Out[23]:

```
<matplotlib.axes._subplots.AxesSubplot at 0xceba0cef60>
```

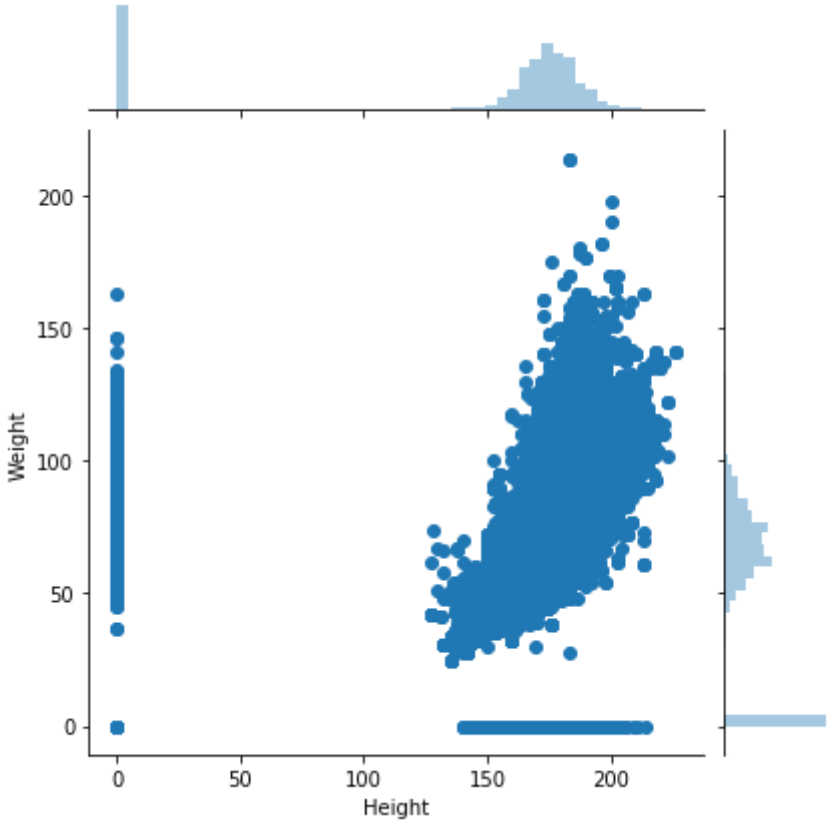


In [24]:

```
sb.jointplot(x='Height', y='Weight', data=data)
```

Out[24]:

```
<seaborn.axisgrid.JointGrid at 0xceba2c8c50>
```

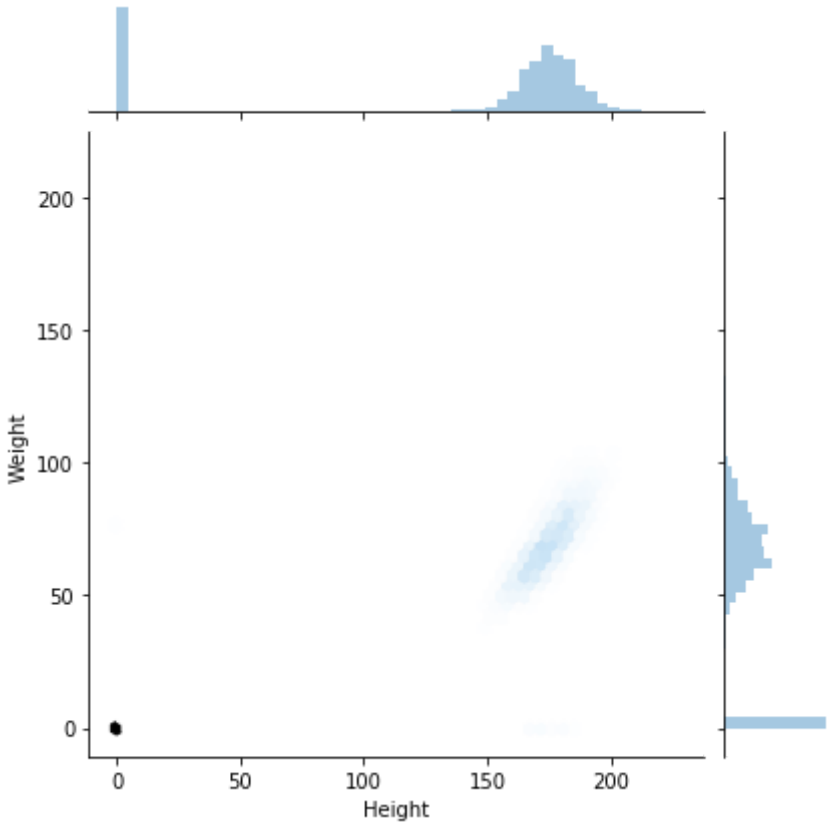


In [25]:

```
sb.jointplot(x='Height', y='Weight', data=data, kind="hex")
```

Out[25]:

```
<seaborn.axisgrid.JointGrid at 0xceba6e3390>
```

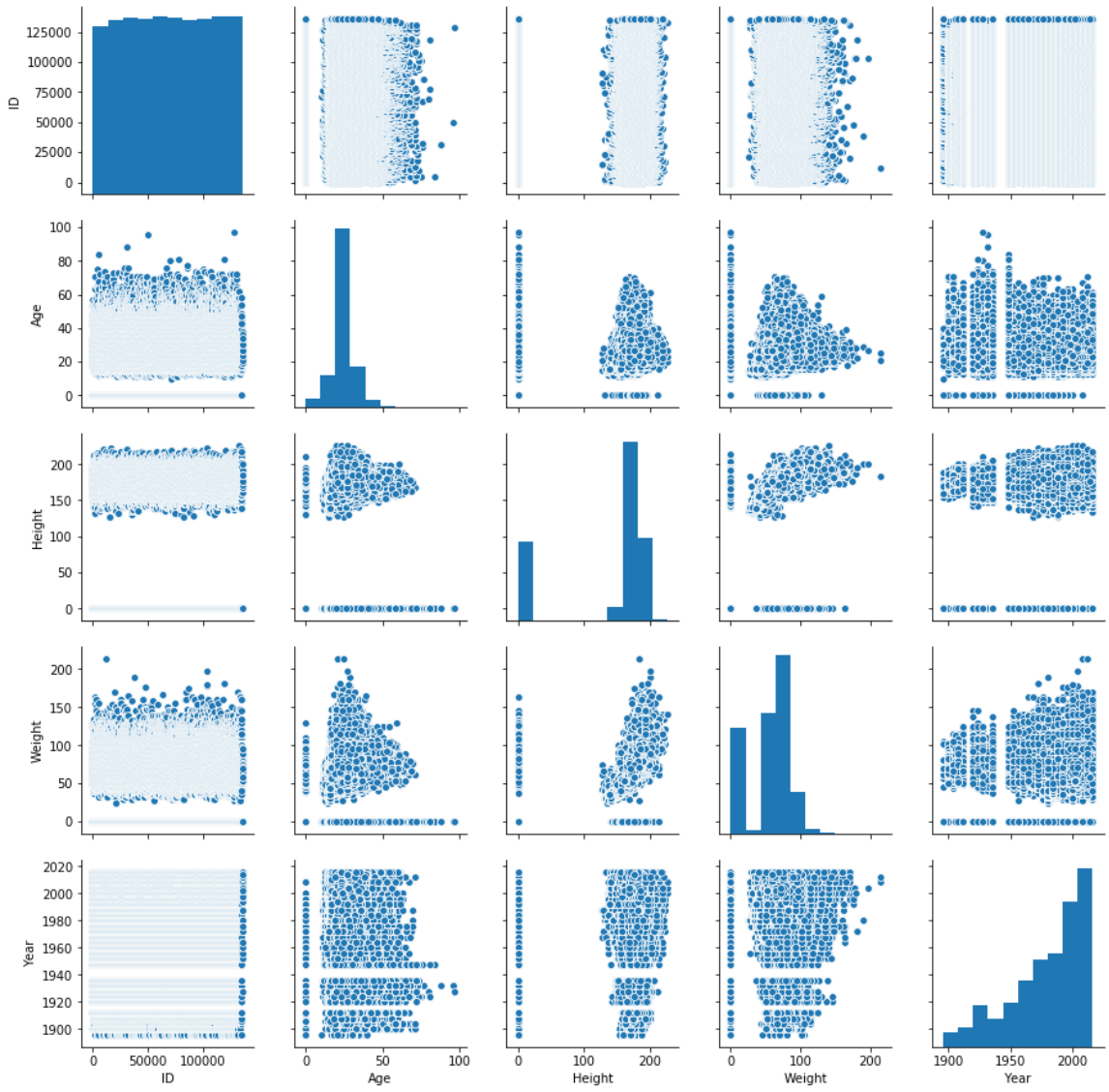


In [26]:

```
sb.pairplot(data)
```

Out[26]:

```
<seaborn.axisgrid.PairGrid at 0xceba85a198>
```



In [27]:

```
sb.pairplot(data, hue="Sex")
```

Out[27]:

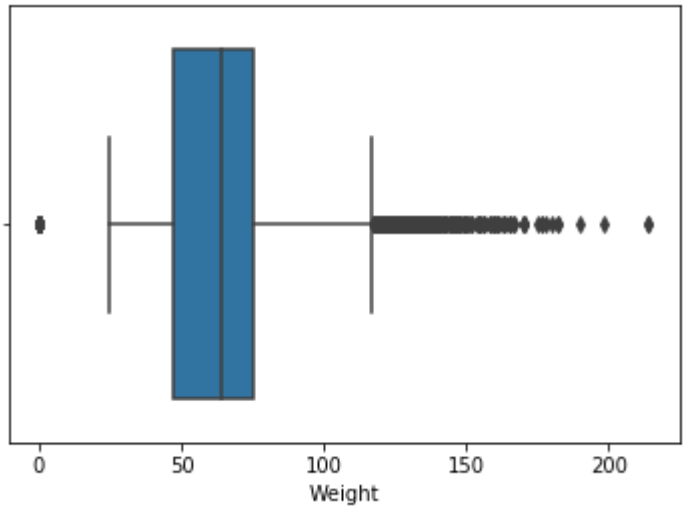
```
<seaborn.axisgrid.PairGrid at 0xcec0cb92e8>
```

In [28]:

```
sb.boxplot(x=data['Weight'])
```

Out[28]:

```
<matplotlib.axes._subplots.AxesSubplot at 0xcec759bcf8>
```

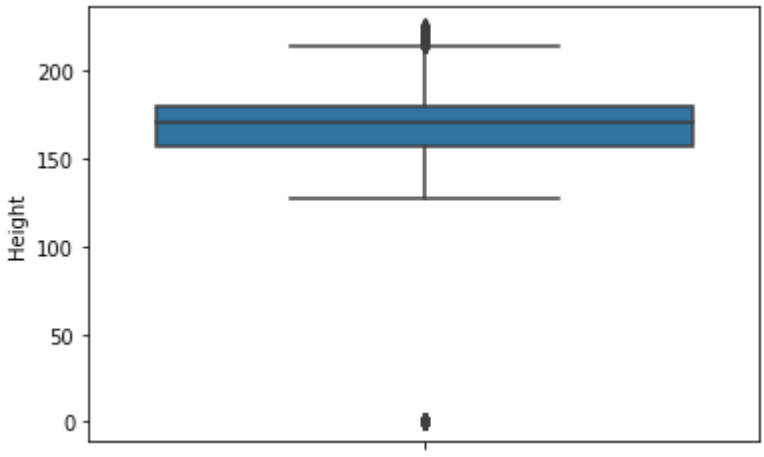


In [29]:

```
sb.boxplot(y=data['Height'])
```

Out[29]:

```
<matplotlib.axes._subplots.AxesSubplot at 0xcec7609710>
```

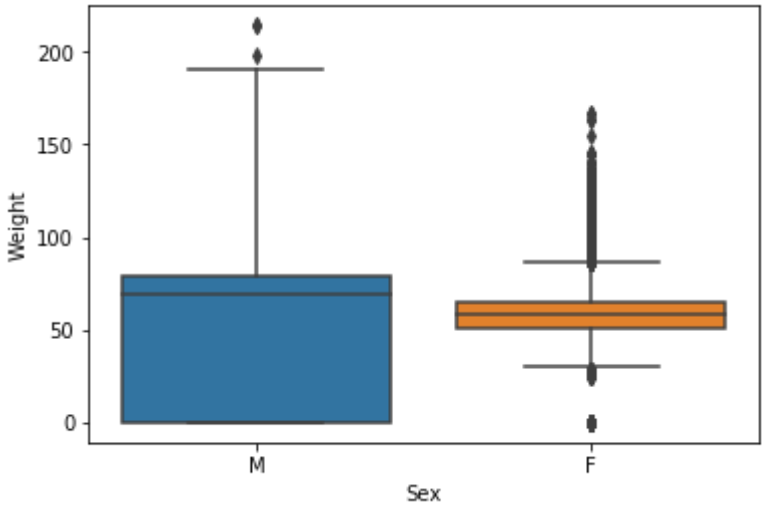


In [30]:

```
sb.boxplot(x='Sex', y='Weight',data=data)
```

Out[30]:

```
<matplotlib.axes._subplots.AxesSubplot at 0xcec7d000f0>
```

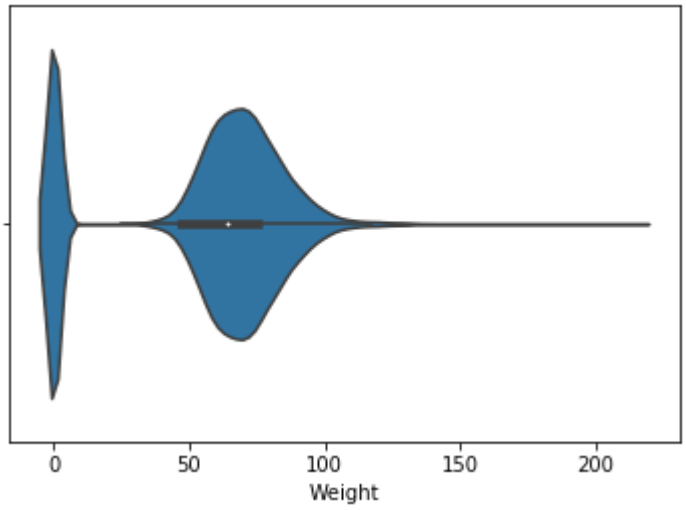


In [31]:

```
sb.violinplot(x=data['Weight'])
```

Out[31]:

```
<matplotlib.axes._subplots.AxesSubplot at 0xcec8095f98>
```

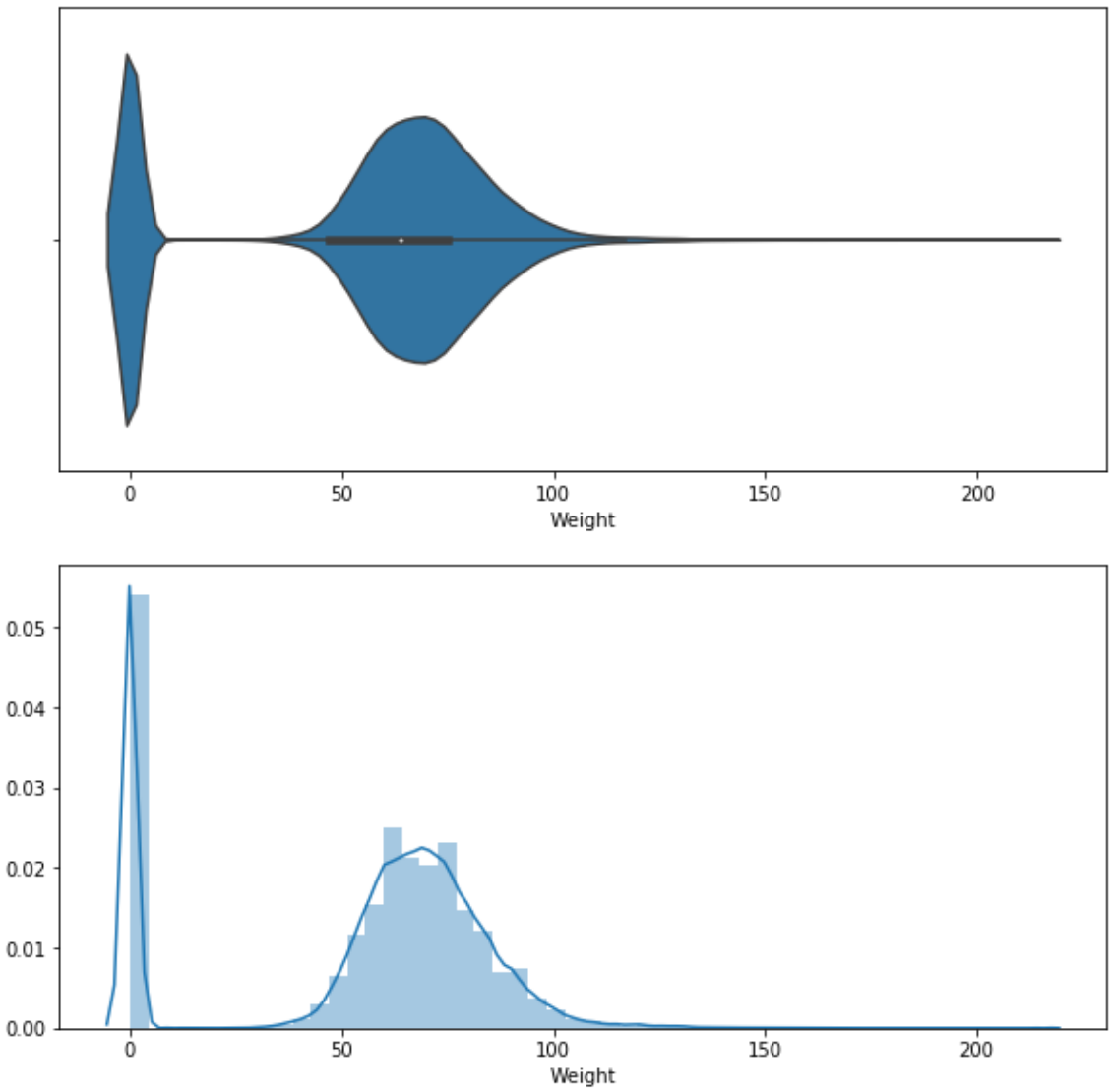


In [32]:

```
fig, ax = plt.subplots(2, 1, figsize=(10,10))
sb.violinplot(ax=ax[0], x=data['Weight'])
sb.distplot(data['Weight'], ax=ax[1])
```

Out[32]:

```
<matplotlib.axes._subplots.AxesSubplot at 0xcec81159e8>
```

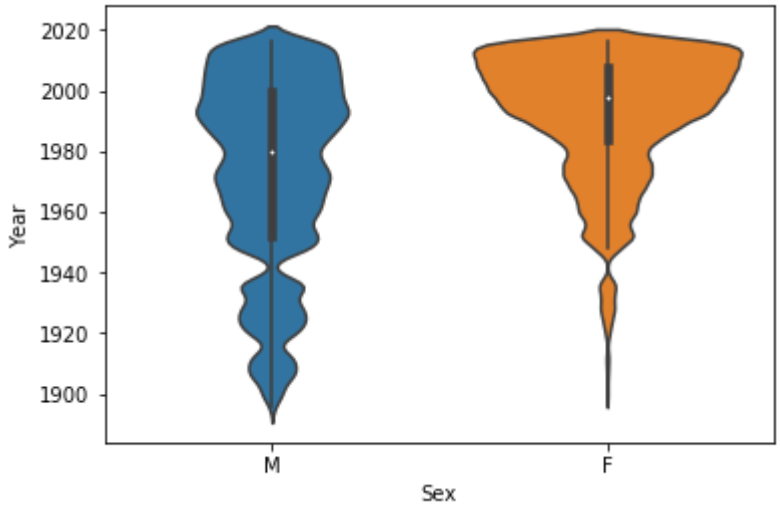


In [33]:

```
sb.violinplot(x='Sex', y='Year',data=data)
```

Out[33]:

```
<matplotlib.axes._subplots.AxesSubplot at 0xcec81eb6d8>
```

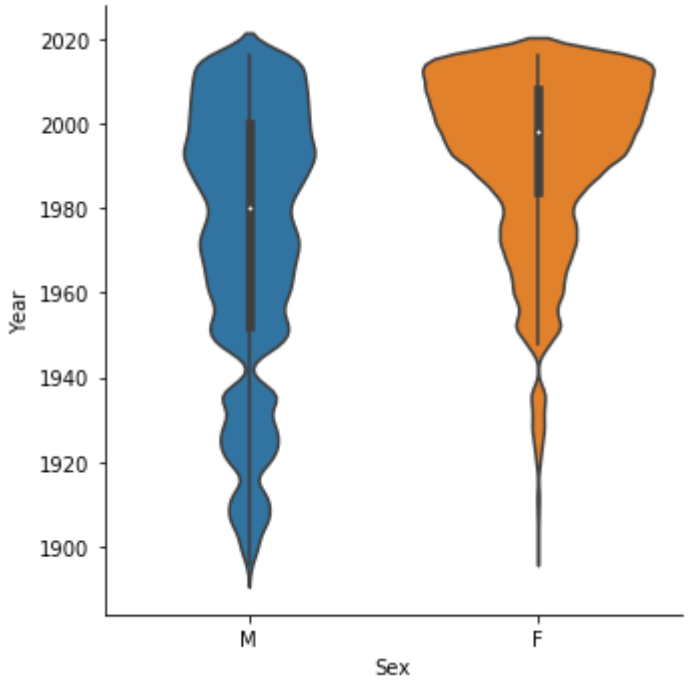


In [34]:

```
sb.catplot(x='Sex', y='Year', data=data, kind="violin", split=True)
```

Out[34]:

```
<seaborn.axisgrid.FacetGrid at 0xcec8095cc0>
```



In [35]:

```
data.corr()
```

Out[35]:

	ID	Age	Height	Weight	Year
ID	1.000000	0.000555	0.011114	0.010938	0.011885
Age	0.000555	1.000000	0.086514	0.114378	0.094453
Height	0.011114	0.086514	1.000000	0.899466	0.652054
Weight	0.010938	0.114378	0.899466	1.000000	0.622125
Year	0.011885	0.094453	0.652054	0.622125	1.000000

In [36]:

```
data.corr(method='pearson')
```

Out[36]:

	ID	Age	Height	Weight	Year
ID	1.000000	0.000555	0.011114	0.010938	0.011885
Age	0.000555	1.000000	0.086514	0.114378	0.094453
Height	0.011114	0.086514	1.000000	0.899466	0.652054
Weight	0.010938	0.114378	0.899466	1.000000	0.622125
Year	0.011885	0.094453	0.652054	0.622125	1.000000

In [37]:

```
data.corr(method='kendall')
```

Out[37]:

	ID	Age	Height	Weight	Year
ID	1.000000	-0.000083	0.001710	0.002794	0.008940
Age	-0.000083	1.000000	0.077636	0.104872	0.057767
Height	0.001710	0.077636	1.000000	0.751348	0.316010
Weight	0.002794	0.104872	0.751348	1.000000	0.308999
Year	0.008940	0.057767	0.316010	0.308999	1.000000

In [38]:

```
data.corr(method='spearman')
```

Out[38]:

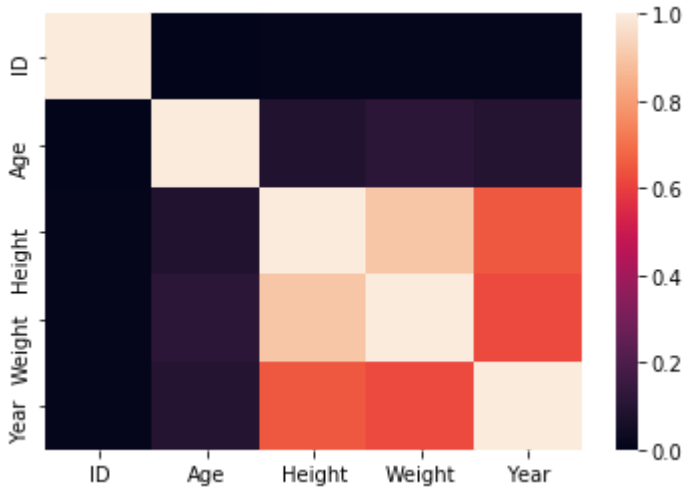
	ID	Age	Height	Weight	Year
ID	1.000000	-0.000118	0.002461	0.004066	0.013191
Age	-0.000118	1.000000	0.105464	0.140278	0.078540
Height	0.002461	0.105464	1.000000	0.884870	0.446163
Weight	0.004066	0.140278	0.884870	1.000000	0.440047
Year	0.013191	0.078540	0.446163	0.440047	1.000000

In [39]:

```
sb.heatmap(data.corr())
```

Out[39]:

```
<matplotlib.axes._subplots.AxesSubplot at 0xcea7fe54e0>
```

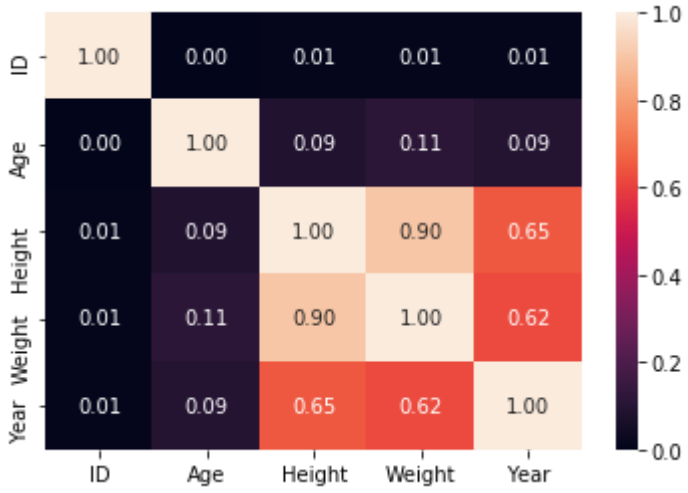


In [40]:

```
sb.heatmap(data.corr(), annot=True, fmt='.2f')
```

Out[40]:

```
<matplotlib.axes._subplots.AxesSubplot at 0xcec9904780>
```



In [41]:

```
sb.heatmap(data.corr(), cmap='YlGnBu', annot=True, fmt='.2f')
```

Out[41]:

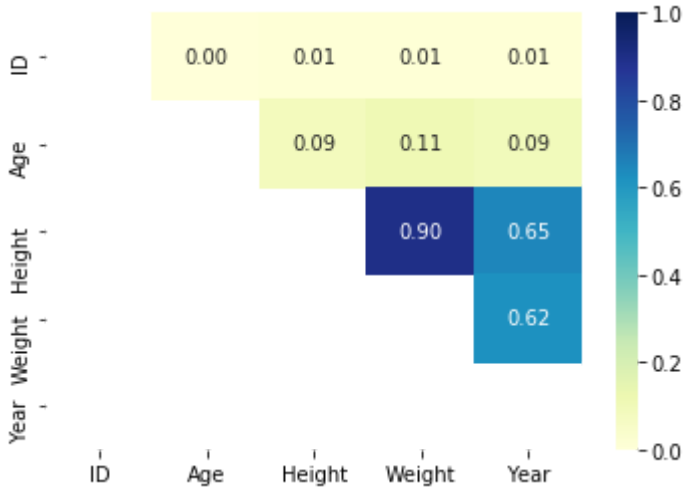
```
<matplotlib.axes._subplots.AxesSubplot at 0xcec9e07a90>
```

In [42]:

```
# Треугольный вариант матрицы
mask = np.zeros_like(data.corr(), dtype=np.bool)
# чтобы оставить нижнюю часть матрицы
# mask[np.triu_indices_from(mask)] = True
# чтобы оставить верхнюю часть матрицы
mask[np.tril_indices_from(mask)] = True
sb.heatmap(data.corr(), mask=mask, cmap='YlGnBu', annot=True, fmt='.2f')
```

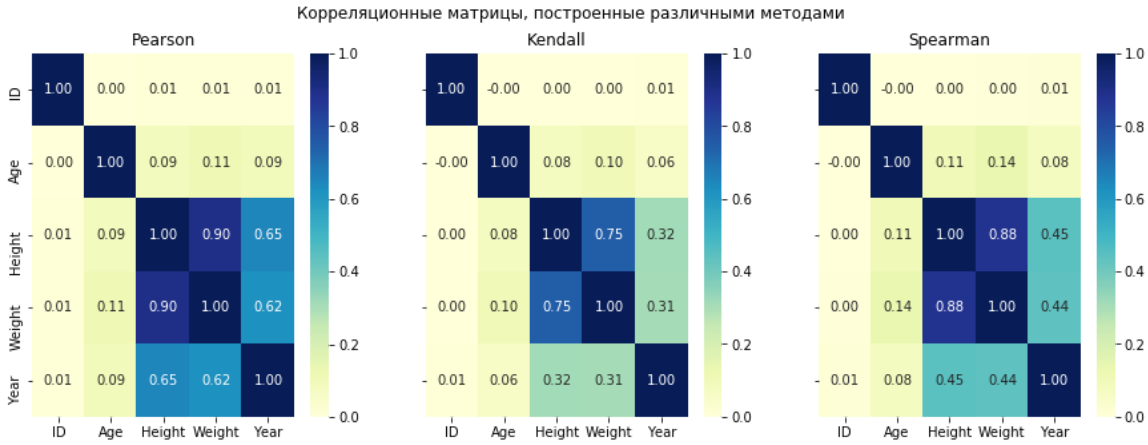
Out[42]:

```
<matplotlib.axes._subplots.AxesSubplot at 0xcec9ebcdd8>
```



In [43]:

```
fig, ax = plt.subplots(1, 3, sharex='col', sharey='row', figsize=(15,5))
sb.heatmap(data.corr(method='pearson'), ax=ax[0], cmap='YlGnBu', annot=True, fmt='.2f')
sb.heatmap(data.corr(method='kendall'), ax=ax[1],cmap='YlGnBu', annot=True, fmt='.2f')
sb.heatmap(data.corr(method='spearman'), ax=ax[2], cmap='YlGnBu', annot=True, fmt='.2f'
)
fig.suptitle('Корреляционные матрицы, построенные различными методами')
ax[0].title.set_text('Pearson')
ax[1].title.set_text('Kendall')
ax[2].title.set_text('Spearman')
```



In [44]:

```
jupyter nbconvert --to pdf --template=../template.tplx eda_visualization.ipynb
```

```
  File "<ipython-input-44-95f9c278bb8a>", line 1
    jupyter nbconvert --to pdf --template=../template.tplx eda_visualizati
on.ipynb
                      ^
SyntaxError: invalid syntax
```

In [ ]:

```

```