KRR ASSIGNMENT #2

Course: AI-311 (KRR)

Topic: SparQL Queries

Student: Riyan Khan Durrani

Reg.No: 2023611

Date: 30/11/2025

Contents

Query 1

Query: List all Nobel Prize categories

```python
from rdflib import Namespace

NOBEL = Namespace("http://data.nobelprize.org/terms/")
RDFS = Namespace("http://www.w3.org/2000/01/rdf-schema#")

sparql_query_list_categories = """
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX nobel: <http://data.nobelprize.org/terms/>

SELECT DISTINCT ?category ?categoryLabel
WHERE {
  ?prize a nobel:NobelPrize ;
         nobel:category ?category .
  OPTIONAL { ?category rdfs:label ?categoryLabel . }
}
ORDER BY ?categoryLabel
"""

list_categories_results = g.query(sparql_query_list_categories)

print("Unique Nobel Prize Categories:")
for row in list_categories_results:
    category_display_name = str(row.categoryLabel) if row.categoryLabel else str(row.category).split('/')[-1]
    print(f"- {category_display_name}")
```

Result:

```
Unique Nobel Prize Categories:
- Chemistry
- Economic Sciences
- Literature
- Peace
- Physics
- Physiology or Medicine
```

Query 2:

Query: List all persons who won the Nobel Prize in Chemistry

```
sparql_query_chemistry_laureates = '''
PREFIX nobel: <http://data.nobelprize.org/terms/>
PREFIX foaf: <http://xmlns.com/foaf/0.1/>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>

SELECT DISTINCT ?laureateName
WHERE {
  ?prize a nobel:NobelPrize .
  ?prize nobel:category <http://data.nobelprize.org/resource/category/Chemistry> .
  ?prize nobel:laureate ?laureate .
  ?laureate foaf:name ?laureateName .
}
ORDER BY ?laureateName
'''

print("Executing SPARQL query for Chemistry laureates...")
results_chemistry_laureates = g.query(sparql_query_chemistry_laureates)

chemistry_laureate_count = len(list(results_chemistry_laureates))
print(f"Total Chemistry Laureates found: {chemistry_laureate_count}")


print("\nChemistry Laureates (ordered by name):")
for row in results_chemistry_laureates:
    print(f"- {row.laureateName}")
```

Result:

```
    Chemistry Laureates (ordered by name):
    - Aaron Ciechanover
...
    - Aaron Klug
    - Ada E. Yonath
    - Adolf Friedrich Johann Butenandt
    - Adolf Otto Reinhold Windaus
    - Ahmed H. Zewail
    - Akira Suzuki
    - Alan G. MacDiarmid
    - Alan J. Heeger
    - Alfred Werner
    - Archer John Porter Martin
    - Arieh Warshel
    - Arne Wilhelm Kaurin Tiselius
    - Arthur Harden
    - Artturi Ilmari Virtanen
    - Avram Hershko
    - Aziz Sancar
    - Bernard L. Feringa
    - Brian K. Kobilka
    - Carl Bosch
    - Charles J. Pedersen
    - Christian B. Anfinsen
    - Dan Shechtman
    - Derek H. R. Barton
    - Donald J. Cram
    - Dorothy Crowfoot Hodgkin
    - Dudley R. Herschbach
    - Eduard Buchner
    - Edwin Mattison McMillan
    - Ei-ichi Negishi
    - Elias James Corey
    - Eric Betzig
    - Ernest Rutherford
    - Ernst Otto Fischer
    - F. Sherwood Rowland
    - Francis William Aston
    - Frederick Sanger
    - Frederick Soddy
    - Friedrich Bergius
    - Fritz Haber
    - Fritz Pregl
    - Frédéric Joliot
    - Geoffrey Wilkinson
    - Georg Wittig
    - George A. Olah
    - George Porter
    - George de Hevesy
    - Gerhard Ertl
    - Gerhard Herzberg
    - Giulio Natta
```

```
    - Giulio Natta
    - Glenn Theodore Seaborg
...
    - Hans Fischer
    - Hans Karl August Simon von Euler-Chelpin
    - Harold Clayton Urey
    - Hartmut Michel
    - Heinrich Otto Wieland
    - Henri Moissan
    - Henry Taube
    - Herbert A. Hauptman
    - Herbert C. Brown
    - Hermann Emil Fischer
    - Hermann Staudinger
    - Hideki Shirakawa
    - Ilya Prigogine
    - Irving Langmuir
    - Irwin Rose
    - Irène Joliot-Curie
    - Jacobus Henricus van 't Hoff
    - James Batcheller Sumner
    - Jaroslav Heyrovsky
    - Jean-Marie Lehn
    - Jean-Pierre Sauvage
    - Jens C. Skou
    - Jerome Karle
    - Johann Deisenhofer
    - Johann Friedrich Wilhelm Adolf von Baeyer
    - John A. Pople
    - John B. Fenn
    - John C. Polanyi
    - John Cowdery Kendrew
    - John E. Walker
    - John Howard Northrop
    - John Warcup Cornforth
    - K. Barry Sharpless
    - Karl Ziegler
    - Kary B. Mullis
    - Kenichi Fukui
    - Koichi Tanaka
    - Kurt Alder
    - Kurt Wüthrich
    - Lars Onsager
    - Leopold Ruzicka
    - Linus Carl Pauling
    - Lord (Alexander R.) Todd
    - Luis F. Leloir
    - Manfred Eigen
    - Marie Curie, née Sklodowska
    - Mario J. Molina
    - Martin Chalfie
    - Martin Karplus
```

- Martin Karplus
- Max Ferdinand Perutz
- Melvin Calvin
- Michael Levitt
- Michael Smith
- Nikolay Nikolaevich Semenov
- Odd Hassel
- Osamu Shimomura
- Otto Hahn
- Otto Paul Hermann Diels
- Otto Wallach
- Paul Berg
- Paul D. Boyer
- Paul J. Crutzen
- Paul J. Flory
- Paul Karrer
- Paul Modrich
- Paul Sabatier
- Peter Agre
- Peter D. Mitchell
- Petrus (Peter) Josephus Wilhelmus Debye
- Richard Adolf Zsigmondy
- Richard E. Smalley
- Richard F. Heck
- Richard Kuhn
- Richard Laurence Millington Synge
- Richard Martin Willstätter
- Richard R. Ernst
- Richard R. Schrock
- Roald Hoffmann
- Robert Bruce Merrifield
- Robert Burns Woodward
- Robert F. Curl Jr.
- Robert H. Grubbs
- Robert Huber
- Robert J. Lefkowitz
- Robert S. Mulliken
- Roderick MacKinnon
- Roger D. Kornberg
- Roger Y. Tsien
- Ronald George Wreyford Norrish
- Rudolph A. Marcus
- Ryoji Noyori
- Sidney Altman
- Sir Cyril Norman Hinshelwood
- Sir Harold W. Kroto
- Sir J. Fraser Stoddart
- Sir Robert Robinson
- Sir William Ramsay
- Stanford Moore
- Stefan W. Hell
- The (Theodor) Svedberg
- Theodore William Richards
- Thomas A. Steitz
- Thomas R. Cech
- Tomas Lindahl
- Venkatraman Ramakrishnan
- Victor Grignard
- Vincent du Vigneaud
- Vladimir Prelog
- Walter Gilbert
- Walter Kohn
- Walter Norman Haworth
- Walther Hermann Nernst
- Wendell Meredith Stanley
- Wilhelm Ostwald
- Willard Frank Libby
- William E. Moerner
- William Francis Giauque
- William H. Stein
- William N. Lipscomb
- William S. Knowles
- Yuan T. Lee
- Yves Chauvin

Query 3:

Query: Who won the Nobel Prize in Chemistry in 1911?

```
[31]
✓ 0s
```

```python
print("Query 3: Listing laureates who won the Nobel Prize in Chemistry in 1911...")

sparql_query_chemistry_1911_final = '''
PREFIX nobel: <http://data.nobelprize.org/terms/>
PREFIX foaf: <http://xmlns.com/foaf/0.1/>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>

SELECT DISTINCT ?laureateName
WHERE {
  ?prize a nobel:NobelPrize .
  ?prize nobel:category <http://data.nobelprize.org/resource/category/Chemistry> .
  ?prize nobel:year "1911"^^xsd:integer .  # Corrected to xsd:integer
  ?prize nobel:laureate ?laureate .
  ?laureate foaf:name ?laureateName .
}
ORDER BY ?laureateName
'''

results_chemistry_1911_final = g.query(sparql_query_chemistry_1911_final)

chemistry_laureate_count_1911 = len(list(results_chemistry_1911_final))
print(f"Total Chemistry Laureates in 1911 found: {chemistry_laureate_count_1911}")
print("Laureate(s) who won the Nobel Prize in Chemistry in 1911:")
for row in results_chemistry_1911_final:
    print(f"- {row.laureateName}")
```

Result:

```
Query 3: Listing laureates who won the Nobel Prize in Chemistry in 1911...
Total Chemistry Laureates in 1911 found: 1
Laureate(s) who won the Nobel Prize in Chemistry in 1911:
- Marie Curie, née Sklodowska
```

Query 4:

Query: List all persons who won the Nobel Prize in Chemistry, ordered by year

```
[32]
✓ 0s
print("Query 4: Listing all persons who won the Nobel Prize in Chemistry, ordered by year...")

sparql_query_chemistry_by_year = '''
PREFIX nobel: <http://data.nobelprize.org/terms/>
PREFIX foaf: <http://xmlns.com/foaf/0.1/>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>

SELECT DISTINCT ?laureateName ?year
WHERE {
  ?prize a nobel:NobelPrize .
  ?prize nobel:category <http://data.nobelprize.org/resource/category/Chemistry> .
  ?prize nobel:year ?year_literal .
  BIND(xsd:integer(?year_literal) AS ?year) .
  ?prize nobel:laureate ?laureate .
  ?laureate foaf:name ?laureateName .
}
ORDER BY ?year ?laureateName
'''

results_chemistry_by_year = g.query(sparql_query_chemistry_by_year)

print(f"Total Chemistry Laureates found: {len(list(results_chemistry_by_year))}")
print("Chemistry Laureates (ordered by year and name):")

results_chemistry_by_year_reiterated = g.query(sparql_query_chemistry_by_year)
for row in results_chemistry_by_year_reiterated:
    print(f"- {row.laureateName} ({row.year})")
```

Result:

```
Query 4: Listing all persons who won the Nobel Prize in Chemistry, ordered by year...
Total Chemistry Laureates found: 175
Chemistry Laureates (ordered by year and name):
- Jacobus Henricus van 't Hoff (1901)
- Hermann Emil Fischer (1902)
- Svante August Arrhenius (1903)
- Sir William Ramsay (1904)
- Johann Friedrich Wilhelm Adolf von Baeyer (1905)
- Henri Moissan (1906)
- Eduard Buchner (1907)
- Ernest Rutherford (1908)
- Wilhelm Ostwald (1909)
- Otto Wallach (1910)
- Marie Curie, née Sklodowska (1911)
- Paul Sabatier (1912)
- Victor Grignard (1912)
- Alfred Werner (1913)
- Theodore William Richards (1914)
- Richard Martin Willstätter (1915)
- Fritz Haber (1918)
- Walther Hermann Nernst (1920)
- Frederick Soddy (1921)
- Francis William Aston (1922)
- Fritz Pregl (1923)
- Richard Adolf Zsigmondy (1925)
- The (Theodor) Svedberg (1926)
- Heinrich Otto Wieland (1927)
- Adolf Otto Reinhold Windaus (1928)
- Arthur Harden (1929)
- Hans Karl August Simon von Euler-Chelpin (1929)
- Hans Fischer (1930)
- Carl Bosch (1931)
- Friedrich Bergius (1931)
- Irving Langmuir (1932)
- Harold Clayton Urey (1934)
- Frédéric Joliot (1935)
- Irène Joliot-Curie (1935)
- Petrus (Peter) Josephus Wilhelmus Debye (1936)
- Paul Karrer (1937)
- Walter Norman Haworth (1937)
- Richard Kuhn (1938)
- Adolf Friedrich Johann Butenandt (1939)
- Leopold Ruzicka (1939)
- George de Hevesy (1943)
- Otto Hahn (1944)
- Artturi Ilmari Virtanen (1945)
- James Batcheller Sumner (1946)
- John Howard Northrop (1946)
- Wendell Meredith Stanley (1946)
- Sir Robert Robinson (1947)
- Arne Wilhelm Kaurin Tiselius (1948)
- William Francis Giauque (1949)
- Kurt Alder (1950)
- Otto Paul Hermann Diels (1950)
- Edwin Mattison McMillan (1951)
- Glenn Theodore Seaborg (1951)
- Archer John Porter Martin (1952)
```

- Archer John Porter Martin (1952)
- Richard Laurence Millington Synge (1952)
- Hermann Staudinger (1953)
- Linus Carl Pauling (1954)
- Vincent du Vigneaud (1955)
- Nikolay Nikolaevich Semenov (1956)
- Sir Cyril Norman Hinshelwood (1956)
- Lord (Alexander R.) Todd (1957)
- Frederick Sanger (1958)
- Jaroslav Heyrovsky (1959)
- Willard Frank Libby (1960)
- Melvin Calvin (1961)
- John Cowdery Kendrew (1962)
- Max Ferdinand Perutz (1962)
- Giulio Natta (1963)
- Karl Ziegler (1963)
- Dorothy Crowfoot Hodgkin (1964)
- Robert Burns Woodward (1965)
- Robert S. Mulliken (1966)
- George Porter (1967)
- Manfred Eigen (1967)
- Ronald George Wreyford Norrish (1967)
- Lars Onsager (1968)
- Derek H. R. Barton (1969)
- Odd Hassel (1969)
- Luis F. Leloir (1970)
- Gerhard Herzberg (1971)
- Christian B. Anfinsen (1972)
- Stanford Moore (1972)
- William H. Stein (1972)
- Ernst Otto Fischer (1973)
- Geoffrey Wilkinson (1973)
- Paul J. Flory (1974)
- John Warcup Cornforth (1975)
- Vladimir Prelog (1975)
- William N. Lipscomb (1976)
- Ilya Prigogine (1977)
- Peter D. Mitchell (1978)
- Georg Wittig (1979)
- Herbert C. Brown (1979)
- Frederick Sanger (1980)
- Paul Berg (1980)
- Walter Gilbert (1980)
- Kenichi Fukui (1981)
- Roald Hoffmann (1981)
- Aaron Klug (1982)
- Henry Taube (1983)
- Robert Bruce Merrifield (1984)
- Herbert A. Hauptman (1985)
- Jerome Karle (1985)
- Dudley R. Herschbach (1986)
- John C. Polanyi (1986)
- Yuan T. Lee (1986)
- Charles J. Pedersen (1987)
- Donald J. Cram (1987)
- Jean-Marie Lehn (1987)
- Hartmut Michel (1988)
- Johann Deisenhofer (1988)
- Robert Huber (1988)
- Sidney Altman (1989)
- Thomas R. Cech (1989)
- Elias James Corey (1990)
- Richard R. Ernst (1991)
- Rudolph A. Marcus (1992)
- Kary B. Mullis (1993)
- Michael Smith (1993)
- George A. Olah (1994)
- F. Sherwood Rowland (1995)
- Mario J. Molina (1995)
- Paul J. Crutzen (1995)
- Richard E. Smalley (1996)
- Robert F. Curl Jr. (1996)
- Sir Harold W. Kroto (1996)
- Jens C. Skou (1997)
- John E. Walker (1997)
- Paul D. Boyer (1997)
- John A. Pople (1998)
- Walter Kohn (1998)
- Ahmed H. Zewail (1999)
- Alan G. MacDiarmid (2000)
- Alan J. Heeger (2000)
- Hideki Shirakawa (2000)
- K. Barry Sharpless (2001)
- Ryoji Noyori (2001)
- William S. Knowles (2001)
- John B. Fenn (2002)
- Koichi Tanaka (2002)
- Kurt Wüthrich (2002)
- Peter Agre (2003)
- Roderick MacKinnon (2003)
- Aaron Ciechanover (2004)
- Avram Hershko (2004)
- Irwin Rose (2004)
- Richard R. Schrock (2005)
- Robert H. Grubbs (2005)
- Yves Chauvin (2005)
- Roger D. Kornberg (2006)
- Gerhard Ertl (2007)
- Martin Chalfie (2008)
- Osamu Shimomura (2008)
- Roger Y. Tsien (2008)
- Ada E. Yonath (2009)
- Thomas A. Steitz (2009)
- Venkatraman Ramakrishnan (2009)
- Akira Suzuki (2010)
- Ei-ichi Negishi (2010)
- Richard F. Heck (2010)
- Dan Shechtman (2011)
- Brian K. Kobilka (2012)
- Robert J. Lefkowitz (2012)
- Arieh Warshel (2013)
- Martin Karplus (2013)
- Michael Levitt (2013)
- Eric Betzig (2014)
- Stefan W. Hell (2014)
- William E. Moerner (2014)
- Aziz Sancar (2015)
- Paul Modrich (2015)
- Tomas Lindahl (2015)
- Bernard L. Feringa (2016)
- Jean-Pierre Sauvage (2016)
- Sir J. Fraser Stoddart (2016)

Query 5:

Query: List all female laureates

```
[33]
✓ 0s
print("Query 5: Listing all female Nobel laureates...")

sparql_query_female_laureates = '''
PREFIX nobel: <http://data.nobelprize.org/terms/>
PREFIX foaf: <http://xmlns.com/foaf/0.1/>

SELECT DISTINCT ?laureateName
WHERE {
  ?laureate a nobel:Laureate .
  ?laureate foaf:gender "female" .
  ?laureate foaf:name ?laureateName .
} # Laureates who won a Nobel Prize are implicitly included through the foaf:gender property on Laureate instances
ORDER BY ?laureateName
'''

results_female_laureates = g.query(sparql_query_female_laureates)

female_laureate_count = len(list(results_female_laureates))
print(f"Total female laureates found: {female_laureate_count}")

results_female_laureates_reiterated = g.query(sparql_query_female_laureates)
print("\nFemale Nobel Laureates (ordered by name):")
for row in results_female_laureates_reiterated:
    print(f"- {row.laureateName}")
```

Result:

```
Query 5: Listing all female Nobel laureates...
Total female laureates found: 48

Female Nobel Laureates (ordered by name):
- Ada E. Yonath
- Alice Munro
- Alva Myrdal
- Aung San Suu Kyi
- Barbara McClintock
- Baroness Bertha Sophie Felicita von Suttner, née Countess Kinsky von Chinic und Tettau
- Betty Williams
- Carol W. Greider
- Christiane Nüsslein-Volhard
- Doris Lessing
- Dorothy Crowfoot Hodgkin
- Elfriede Jelinek
- Elinor Ostrom
- Elizabeth H. Blackburn
- Ellen Johnson Sirleaf
- Emily Greene Balch
- Françoise Barré-Sinoussi
- Gabriela Mistral
- Gertrude B. Elion
- Gerty Theresa Cori, née Radnitz
- Grazia Deledda
- Herta Müller
- Irène Joliot-Curie
- Jane Addams
- Jody Williams
- Leymah Gbowee
- Linda B. Buck
- Mairead Corrigan
- Malala Yousafzai
- Maria Goeppert Mayer
- Marie Curie, née Sklodowska
- May-Britt Moser
- Mother Teresa
- Nadine Gordimer
- Nelly Sachs
- Pearl Buck
- Rigoberta Menchú Tum
- Rita Levi-Montalcini
- Rosalyn Yalow
- Selma Ottilia Lovisa Lagerlöf
- Shirin Ebadi
- Sigrid Undset
- Svetlana Alexievich
- Tawakkol Karman
- Toni Morrison
- Wangari Muta Maathai
- Wislawa Szymborska
- Youyou Tu
```

Query 6:

Query: Laureates from year 2000 with birth/death dates

```
print("Query 6: Listing laureates from the year 2000 with birth/death dates...")

sparql_query_laureates_2000 = '''
PREFIX nobel: <http://data.nobelprize.org/terms/>
PREFIX foaf: <http://xmlns.com/foaf/0.1/>
PREFIX dbpedia: <http://dbpedia.org/ontology/>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>

SELECT DISTINCT ?laureateName ?birthDate (SAMPLE(?deathDate) AS ?deathDateSample)
WHERE {
  ?prize a nobel:NobelPrize .
  ?prize nobel:year "2000"^^xsd:integer .
  ?prize nobel:laureate ?laureate .
  ?laureate foaf:name ?laureateName .
  ?laureate foaf:birthday ?birthDate .
  OPTIONAL { ?laureate dbpedia:dateOfDeath ?deathDate . }
}
GROUP BY ?laureateName ?birthDate
ORDER BY ?laureateName
'''

results_laureates_2000 = g.query(sparql_query_laureates_2000)

laureate_2000_count = len(list(results_laureates_2000))
print(f"Total Laureates found for the year 2000: {laureate_2000_count}")

print("\nLaureates from year 2000:")

results_laureates_2000_reiterated = g.query(sparql_query_laureates_2000)
for row in results_laureates_2000_reiterated:
    death_info = row.deathDateSample if row.deathDateSample else 'N/A'
    print(f"- Name: {row.laureateName}, Birth Date: {row.birthDate}, Death Date: {death_info}")
```

Result:

```
Query 6: Listing laureates from the year 2000 with birth/death dates...
Total Laureates found for the year 2000: 13

Laureates from year 2000:
- Name: Alan G. MacDiarmid, Birth Date: 1927-04-14, Death Date: N/A
- Name: Alan J. Heeger, Birth Date: 1936-01-22, Death Date: N/A
- Name: Arvid Carlsson, Birth Date: 1923-01-25, Death Date: N/A
- Name: Daniel L. McFadden, Birth Date: 1937-07-29, Death Date: N/A
- Name: Eric R. Kandel, Birth Date: 1929-11-07, Death Date: N/A
- Name: Gao Xingjian, Birth Date: 1940-01-04, Death Date: N/A
- Name: Herbert Kroemer, Birth Date: 1928-08-25, Death Date: N/A
- Name: Hideki Shirakawa, Birth Date: 1936-08-20, Death Date: N/A
- Name: Jack S. Kilby, Birth Date: 1923-11-08, Death Date: N/A
- Name: James J. Heckman, Birth Date: 1944-04-19, Death Date: N/A
- Name: Kim Dae-jung, Birth Date: 1925-12-03, Death Date: N/A
- Name: Paul Greengard, Birth Date: 1925-12-11, Death Date: N/A
- Name: Zhores I. Alferov, Birth Date: 1930-03-15, Death Date: N/A
```

Query 7

Query: Laureates from Sweden or Finland

```
[35]
✓ 8s
    print("Query 7: Listing laureates from Sweden or Finland")

    sparql_query_sweden_finland_revised = '''
    PREFIX nobel: <http://data.nobelprize.org/terms/>
    PREFIX foaf: <http://xmlns.com/foaf/0.1/>
    PREFIX dbpedia: <http://dbpedia.org/ontology/>

    SELECT DISTINCT ?laureateName ?countryName
    WHERE {
      ?laureate a nobel:Laureate .
      ?laureate foaf:name ?laureateName .

      {
        ?laureate dbpedia:birthPlace ?place .
        ?place a dbpedia:Country .
        FILTER (?place = <http://data.nobelprize.org/resource/country/Sweden> || ?place = <http://data.nobelprize.org/resource/country/Finland>)
        BIND (IF(?place = <http://data.nobelprize.org/resource/country/Sweden>, "Sweden", "Finland") AS ?countryName)
      } UNION {
        ?laureate dbpedia:deathPlace ?place .
        ?place a dbpedia:Country .
        FILTER (?place = <http://data.nobelprize.org/resource/country/Sweden> || ?place = <http://data.nobelprize.org/resource/country/Finland>)
        BIND (IF(?place = <http://data.nobelprize.org/resource/country/Sweden>, "Sweden", "Finland") AS ?countryName)
      } UNION {
        ?laureate nobel:affiliation ?affiliation .
        ?affiliation nobel:country ?countryUri .
        FILTER (?countryUri = <http://data.nobelprize.org/resource/country/Sweden> || ?countryUri = <http://data.nobelprize.org/resource/country/Finland>)
        BIND (IF(?countryUri = <http://data.nobelprize.org/resource/country/Sweden>, "Sweden", "Finland") AS ?countryName)
      }
    }
    ORDER BY ?laureateName
    '''

    results_sweden_finland_revised = g.query(sparql_query_sweden_finland_revised)

    sweden_finland_laureate_count_revised = len(list(results_sweden_finland_revised))
    print(f"Total laureates found from Sweden or Finland : {sweden_finland_laureate_count_revised}")

    print("\nLaureates from Sweden or Finland:")
    # Re-execute query to iterate through results as list(results) consumes iterator
    results_sweden_finland_reiterated_revised = g.query(sparql_query_sweden_finland_revised)
    for row in results_sweden_finland_reiterated_revised:
        print(f"- {row.laureateName} (Country: {row.countryName})")
```

Result:

```
Query 7: Listing laureates from Sweden or Finland
Total laureates found from Sweden or Finland : 37

Laureates from Sweden or Finland:
- Allvar Gullstrand (Country: Sweden)
- Alva Myrdal (Country: Sweden)
- Arne Wilhelm Kaurin Tiselius (Country: Sweden)
- Artturi Ilmari Virtanen (Country: Finland)
- Arvid Carlsson (Country: Sweden)
- Axel Hugo Theodor Theorell (Country: Sweden)
- Bengt Holmström (Country: Finland)
- Bengt I. Samuelsson (Country: Sweden)
- Bertil Ohlin (Country: Sweden)
- Carl Gustaf Verner von Heidenstam (Country: Sweden)
- Dag Hjalmar Agne Carl Hammarskjöld (Country: Sweden)
- Erik Axel Karlfeldt (Country: Sweden)
- Eyvind Johnson (Country: Sweden)
- Frans Eemil Sillanpää (Country: Finland)
- Gunnar Myrdal (Country: Sweden)
- Hannes Olof Gösta Alfvén (Country: Sweden)
- Hans Karl August Simon von Euler-Chelpin (Country: Sweden)
- Harry Martinson (Country: Sweden)
- Kai M. Siegbahn (Country: Sweden)
- Karl Hjalmar Branting (Country: Sweden)
- Karl Manne Georg Siegbahn (Country: Sweden)
- Klas Pontus Arnoldson (Country: Sweden)
- Lars Olof Jonathan (Nathan) Söderblom (Country: Sweden)
- Martti Ahtisaari (Country: Finland)
- Nelly Sachs (Country: Sweden)
- Nils Gustaf Dalén (Country: Sweden)
- Pär Fabian Lagerkvist (Country: Sweden)
- Ragnar Granit (Country: Sweden)
- Robert Bárány (Country: Sweden)
- Selma Ottilia Lovisa Lagerlöf (Country: Sweden)
- Sune K. Bergström (Country: Sweden)
- Svante August Arrhenius (Country: Sweden)
- The (Theodor) Svedberg (Country: Sweden)
- Tomas Lindahl (Country: Sweden)
- Tomas Tranströmer (Country: Sweden)
- Torsten N. Wiesel (Country: Sweden)
- Ulf von Euler (Country: Sweden)
```

Query 8

Query: Average age of Chemistry laureates at award time

```
[36]
✓ 0s
print("Query 8: Calculating the average age of Chemistry laureates at award time...")

sparql_query_avg_age_chemistry = '''
PREFIX nobel: <http://data.nobelprize.org/terms/>
PREFIX foaf: <http://xmlns.com/foaf/0.1/>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>

SELECT (AVG(?age) AS ?averageAge)
WHERE {
  ?prize a nobel:NobelPrize .
  ?prize nobel:category <http://data.nobelprize.org/resource/category/Chemistry> .
  ?prize nobel:laureate ?laureate .
  ?prize nobel:year ?prizeYearLiteral .
  ?laureate foaf:birthday ?birthDateLiteral .

  # Extract year from birthDateLiteral (e.g., "1927-04-14" -> 1927)
  BIND(xsd:integer(SUBSTR(STR(?birthDateLiteral), 1, 4)) AS ?birthYear) .

  # Cast prize year to integer
  BIND(xsd:integer(?prizeYearLiteral) AS ?prizeYear) .

  # Calculate age
  BIND((?prizeYear - ?birthYear) AS ?age) .
}
'''

results_avg_age_chemistry = g.query(sparql_query_avg_age_chemistry)

for row in results_avg_age_chemistry:
    if row.averageAge:
        print(f"Average age of Chemistry laureates at award time: {float(row.averageAge):.2f} years")
    else:
        print("Could not calculate average age for Chemistry laureates.")
```

Result:

```
Query 8: Calculating the average age of Chemistry laureates at award time...
Average age of Chemistry laureates at award time: 58.04 years
```

Query 10

Query: Average age of laureates per category at award time

```
print("Query 10: Calculating the average age of laureates per category at award time...")

sparql_query_avg_age_per_category = '''
PREFIX nobel: <http://data.nobelprize.org/terms/>
PREFIX foaf: <http://xmlns.com/foaf/0.1/>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>

SELECT ?categoryLabel (AVG(?age) AS ?averageAge)
WHERE {
  ?prize a nobel:NobelPrize .
  ?prize nobel:category ?categoryURI .
  ?categoryURI rdfs:label ?categoryLabel .
  ?prize nobel:laureate ?laureate .
  ?prize nobel:year ?prizeYearLiteral .
  ?laureate foaf:birthday ?birthDateLiteral .

  # Extract year from birthDateLiteral (e.g., "1927-04-14" -> 1927)
  BIND(xsd:integer(SUBSTR(STR(?birthDateLiteral), 1, 4)) AS ?birthYear) .

  # Cast prize year to integer
  BIND(xsd:integer(?prizeYearLiteral) AS ?prizeYear) .

  # Calculate age
  BIND((?prizeYear - ?birthYear) AS ?age) .
}
GROUP BY ?categoryLabel
ORDER BY DESC(?averageAge)
'''

results_avg_age_per_category = g.query(sparql_query_avg_age_per_category)

print("\nAverage age of laureates at award time by category:")
for row in results_avg_age_per_category:
    if row.averageAge:
        print(f"- {row.categoryLabel}: {float(row.averageAge):.2f} years")
    else:
        print(f"- {row.categoryLabel}: Could not calculate average age.")
```

Result:

```
Query 10: Calculating the average age of laureates per category at award time...

Average age of laureates at award time by category:
- Economic Sciences: 67.09 years
- Literature: 64.67 years
- Peace: 61.40 years
- Chemistry: 58.04 years
- Physiology or Medicine: 57.97 years
- Physics: 55.37 years
```