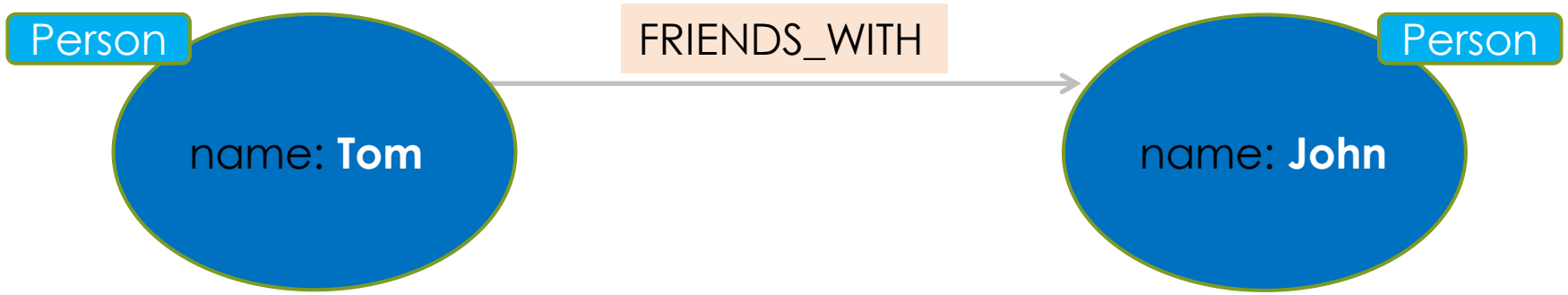
Neo4j II - Relationships

HIGHER DIPLOMA IN DATA ANALYTICS

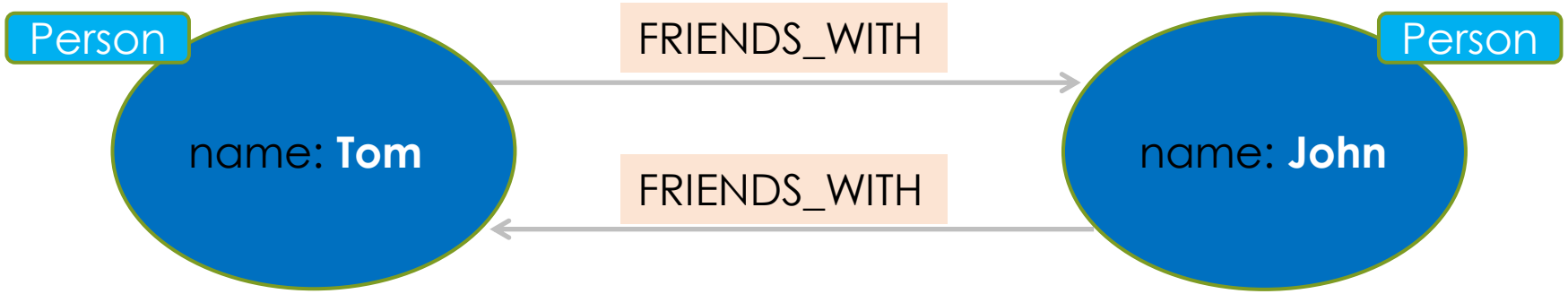
Relationships

- A *relationship* is an entity that encodes a directed connection between exactly two nodes, the *source node* and the *target node*.
- An *outgoing* relationship is a directed relationship from the point of view of its source node.
- An *incoming* relationship is a directed relationship from the point of view of its target node.
- A relationship can have properties but is assigned exactly one relationship type.

Relationships



Relationships



Relationships

Relationships

- `()`
- `(:Person)`
- `(:Person{name:"Tom"})`

Relationships

- `()`
- `(:Person)`
- `(:Person{name:"Tom"})`

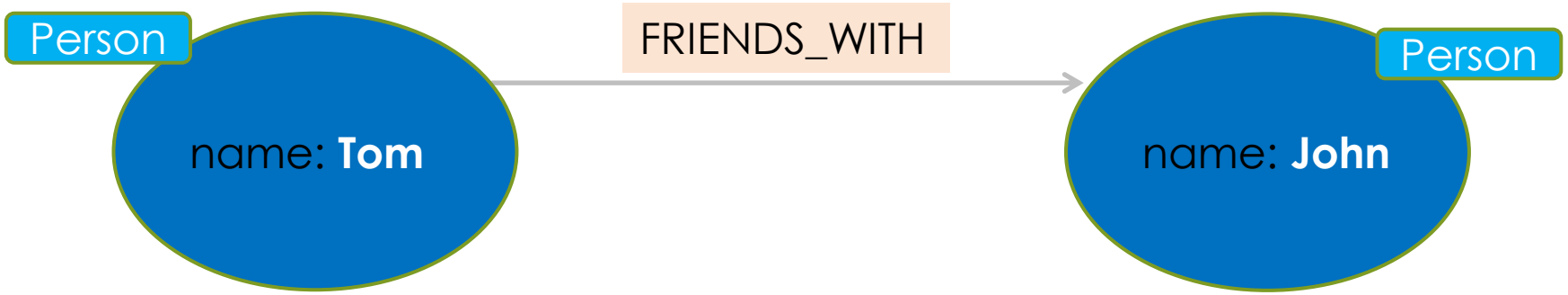
- `-[:FRIENDS_WITH]->`
- `<-[:FRIENDS_WITH]-`

Creating a Relationship

```
CREATE(p1:Person{name:"Tom"})-[r:FRIENDS_WITH]->(p2:Person{name:"John"})
RETURN p1, r, p2
```

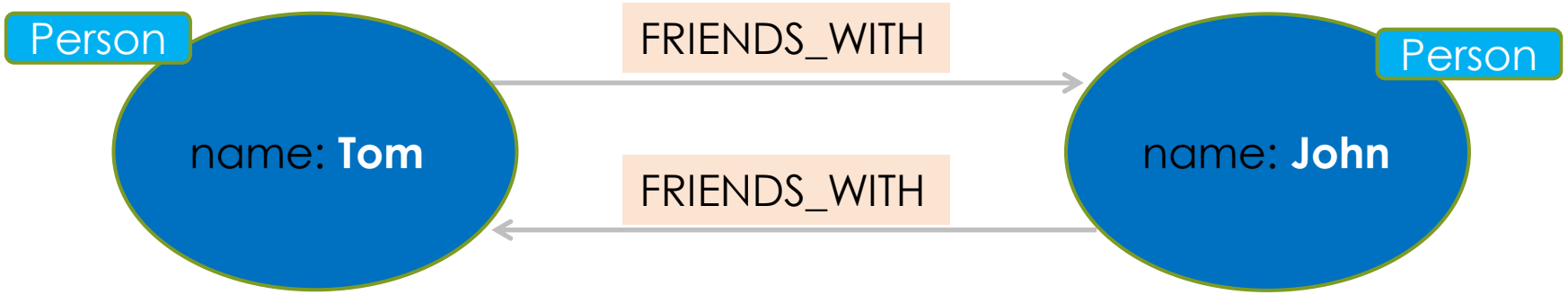
Creating a Relationship

```
CREATE(p1:Person{name:"Tom"})-[r:FRIENDS_WITH]->(p2:Person{name:"John"})
RETURN p1, r, p2
```



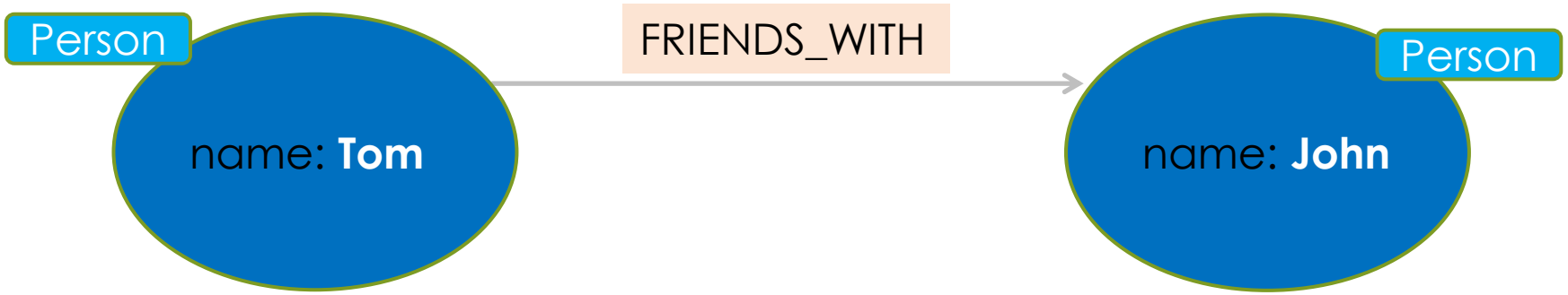
Creating a Relationship

```
CREATE(p1:Person{name:"Tom"})-[r:FRIENDS_WITH]->(p2:Person{name:"John"})
RETURN p1, r, p2
```

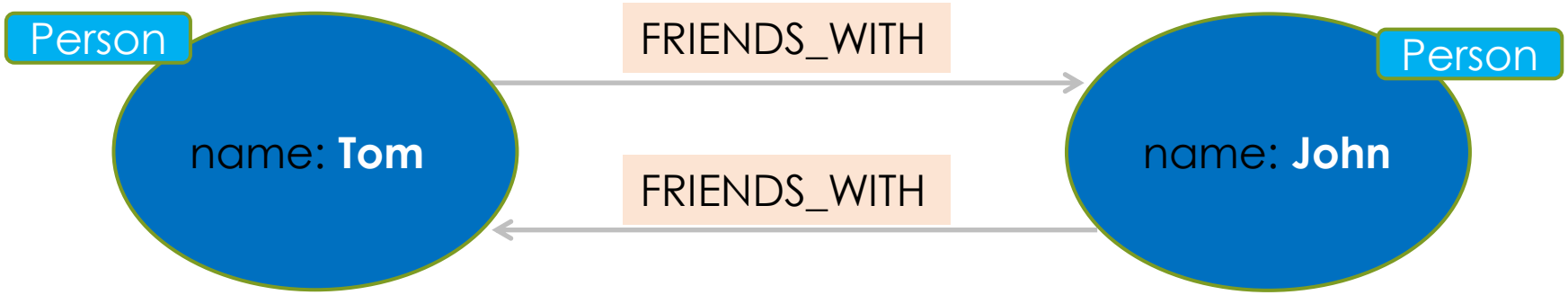



```
MATCH(p1:Person{name:"John"}),(p2:Person{name:"Tom"})
CREATE(p1)-[r:FRIENDS_WITH]->(p2)
RETURN p1, r, p2
```

Creating a Relationship



Creating a Relationship




```
MATCH(p1:Person{name:"John"}),(p2:Person{name:"Tom"})
MERGE(p1)-[r:FRIENDS_WITH]->(p2)
RETURN p1,r,p2
```

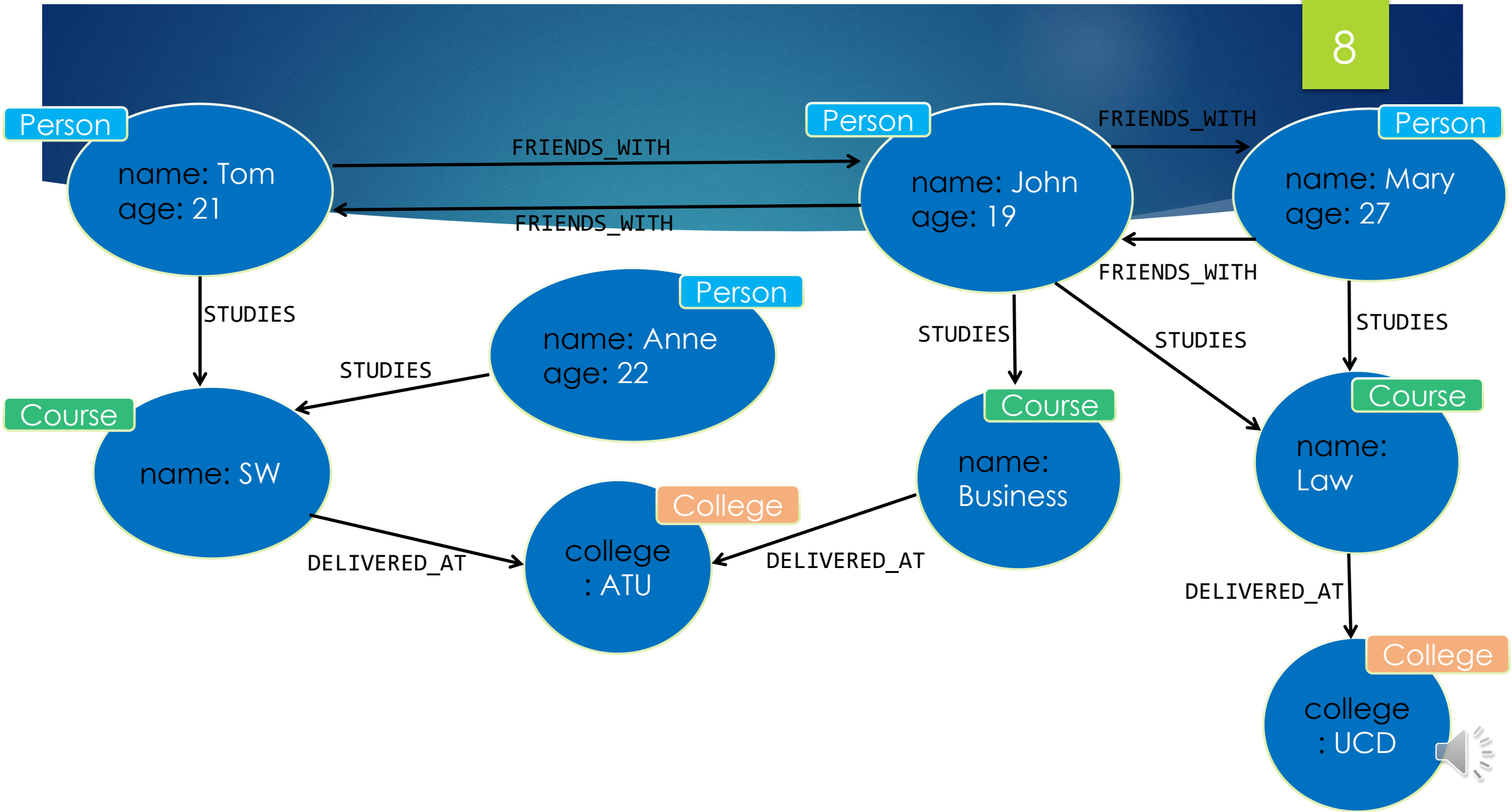
Creating a Relationship

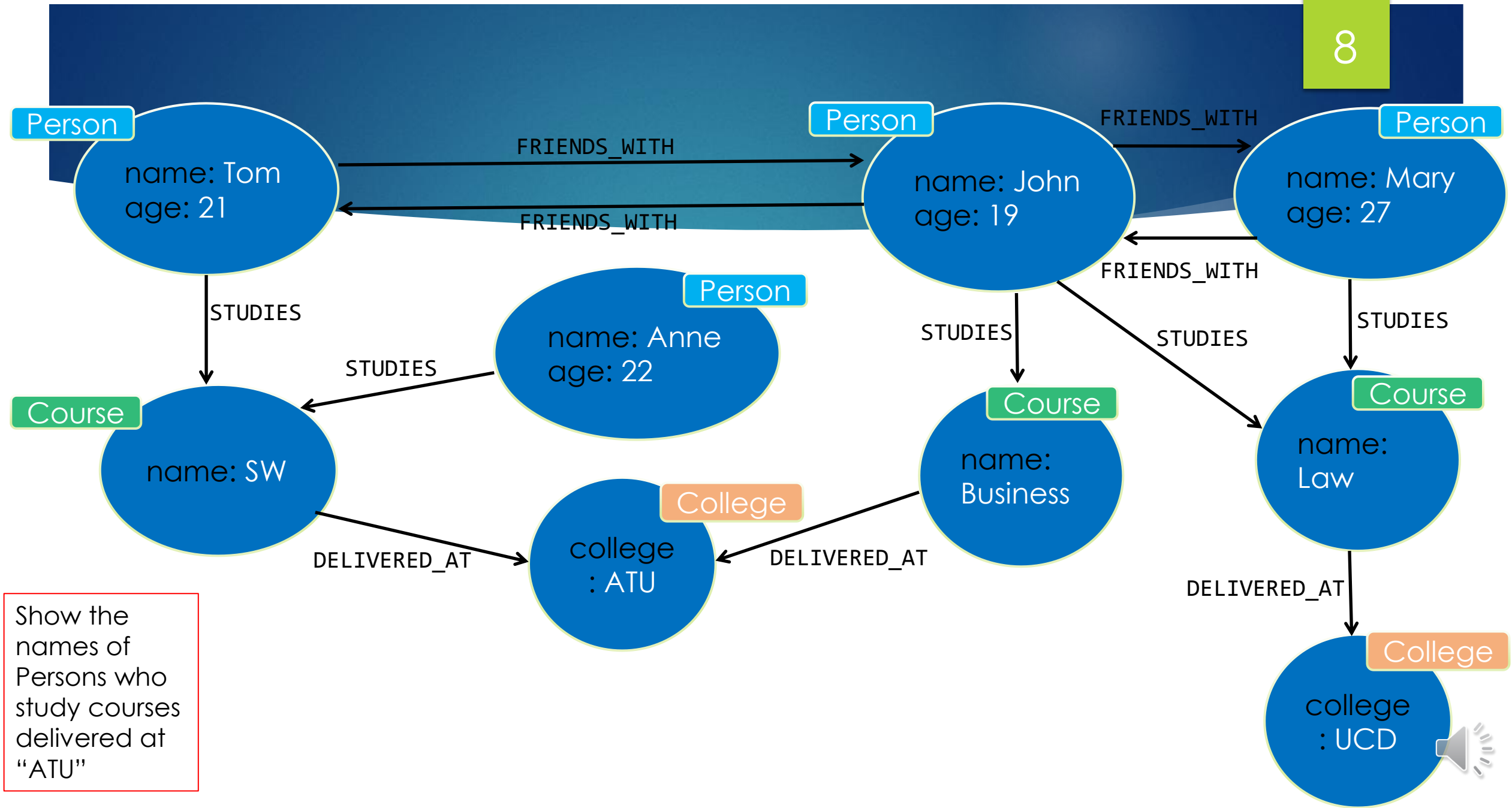
- Relationships can also have properties.
- Create a directional "FOLLOWS" Relationship between existing nodes "Tom" and "John", with a property key = *since* and a value = "*2022-03-01*".

Creating a Relationship

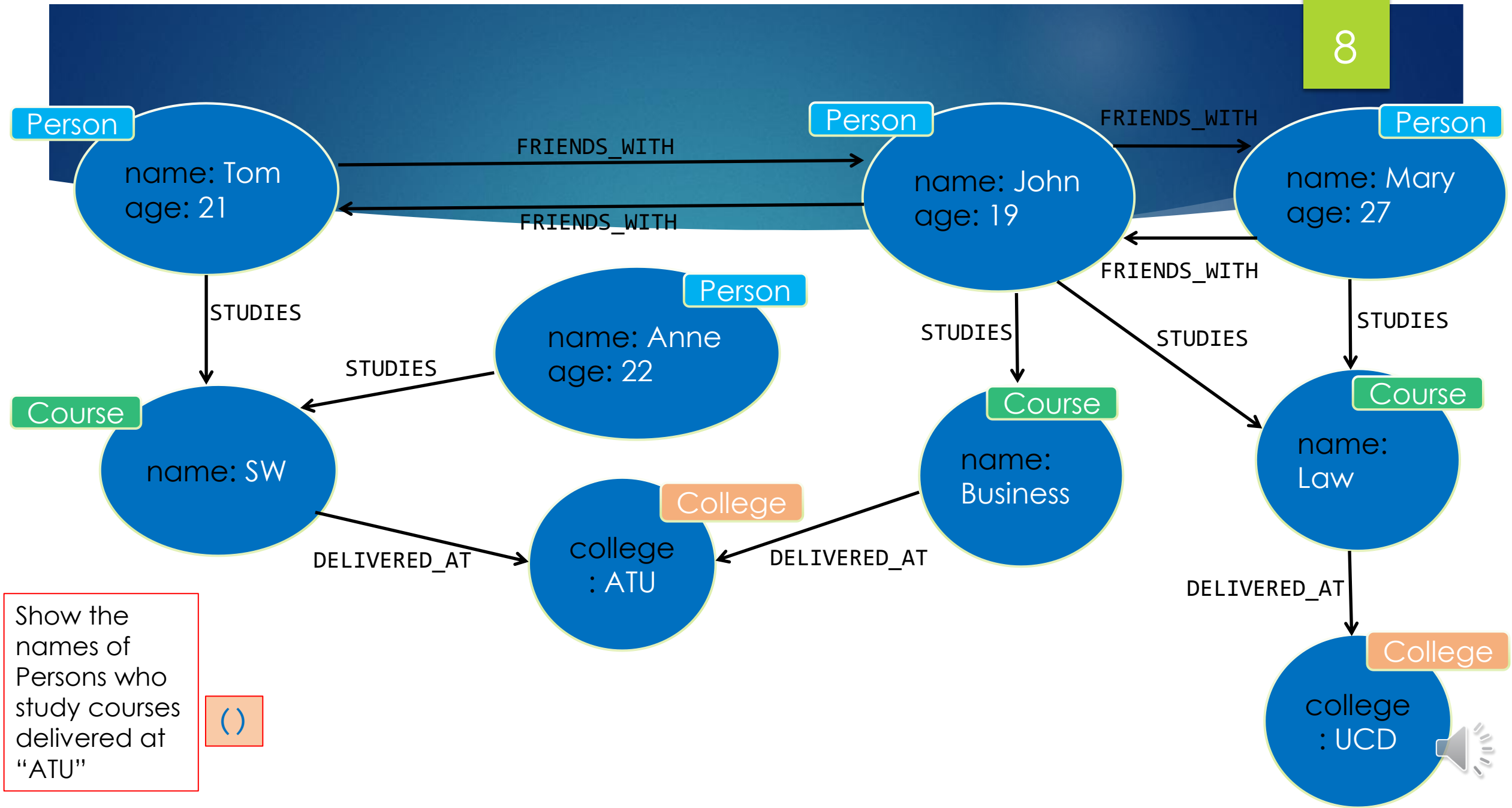
- Relationships can also have properties.
- Create a directional "FOLLOWS" Relationship between existing nodes "Tom" and "John", with a property key = *since* and a value = "*2022-03-01*".

```
MATCH(p1:Person{name:"Tom"}),(p2:Person{name:"John"})
MERGE(p1)-[r:FOLLOWS{since:"2022-03-01"}]->(p2)
RETURN p1, r, p2
```


Person
name: Tom
age: 21
FRIENDS_WITH
FRIENDS_WITH
Person
name: John
age: 19
FRIENDS_WITH
Person
name: Mary
age: 27
FRIENDS_WITH
STUDIES
Person
name: Anne
age: 22
STUDIES
STUDIES
STUDIES
STUDIES
Course
name: SW
Course
name:
Business
Course
name:
Law
College
college
: ATU
DELIVERED_AT
DELIVERED_AT
DELIVERED_AT
College
college
: UCD

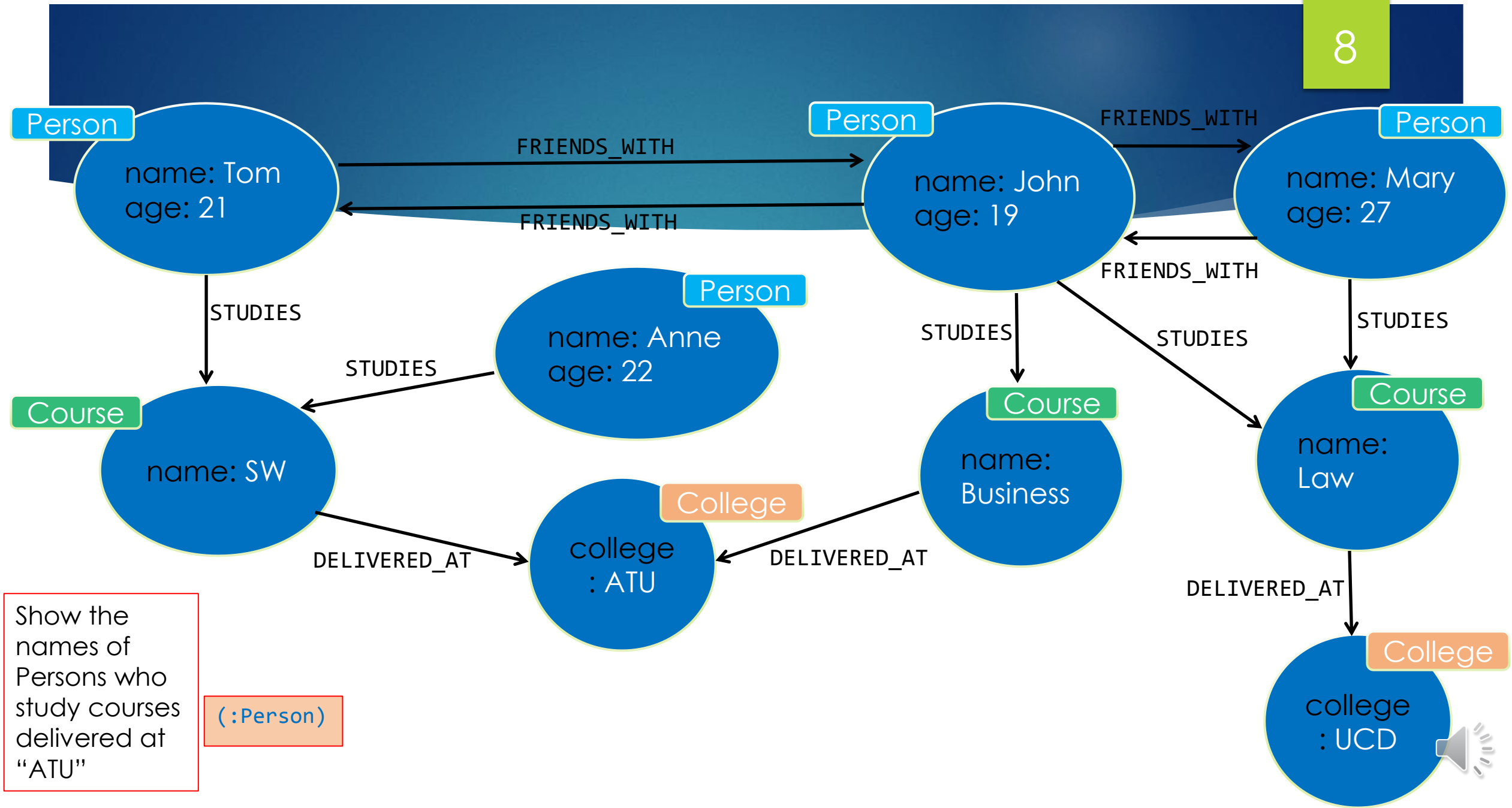


Show the names of Persons who study courses delivered at "ATU"



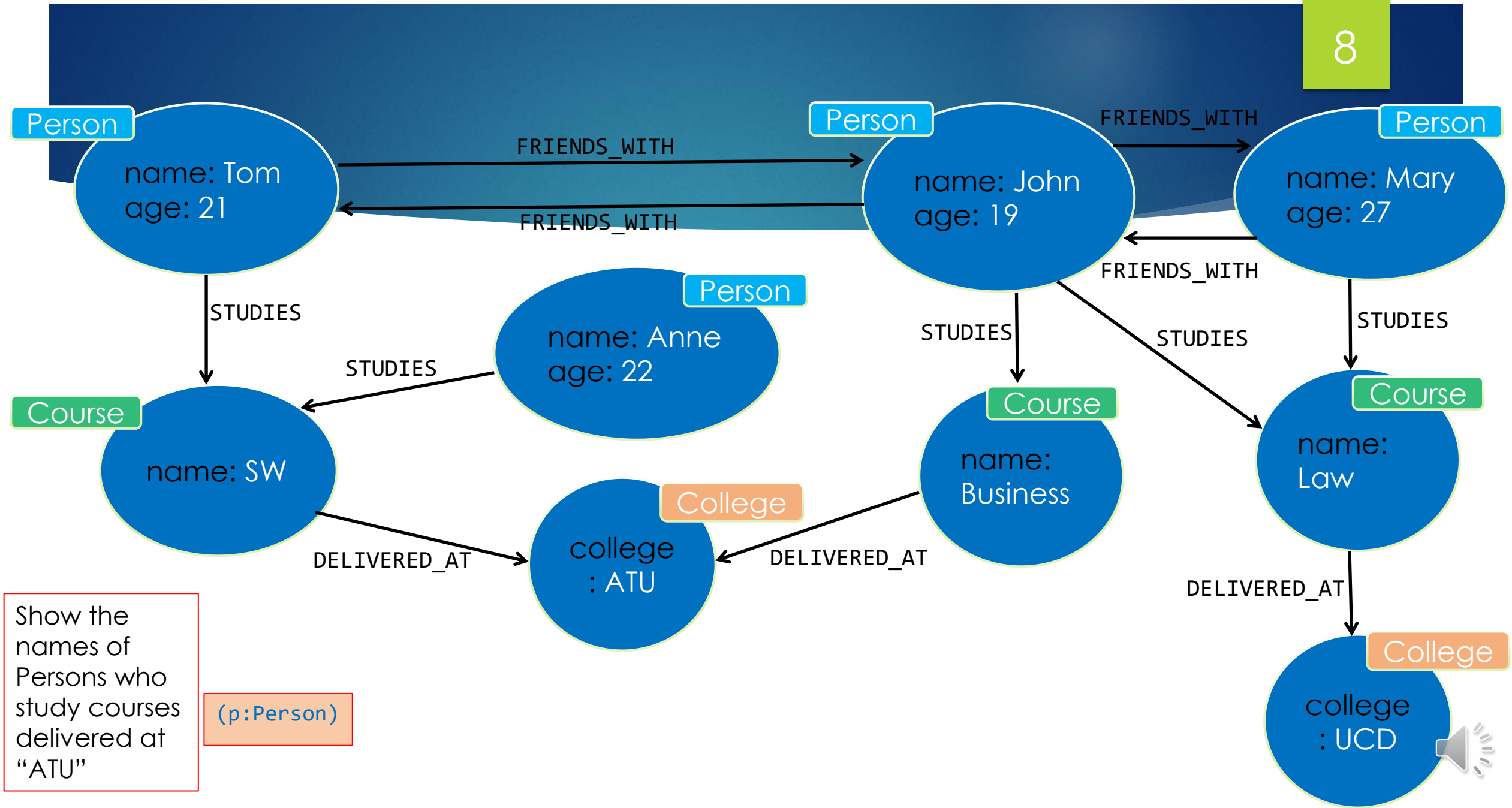
Show the names of Persons who study courses delivered at "ATU"

( )



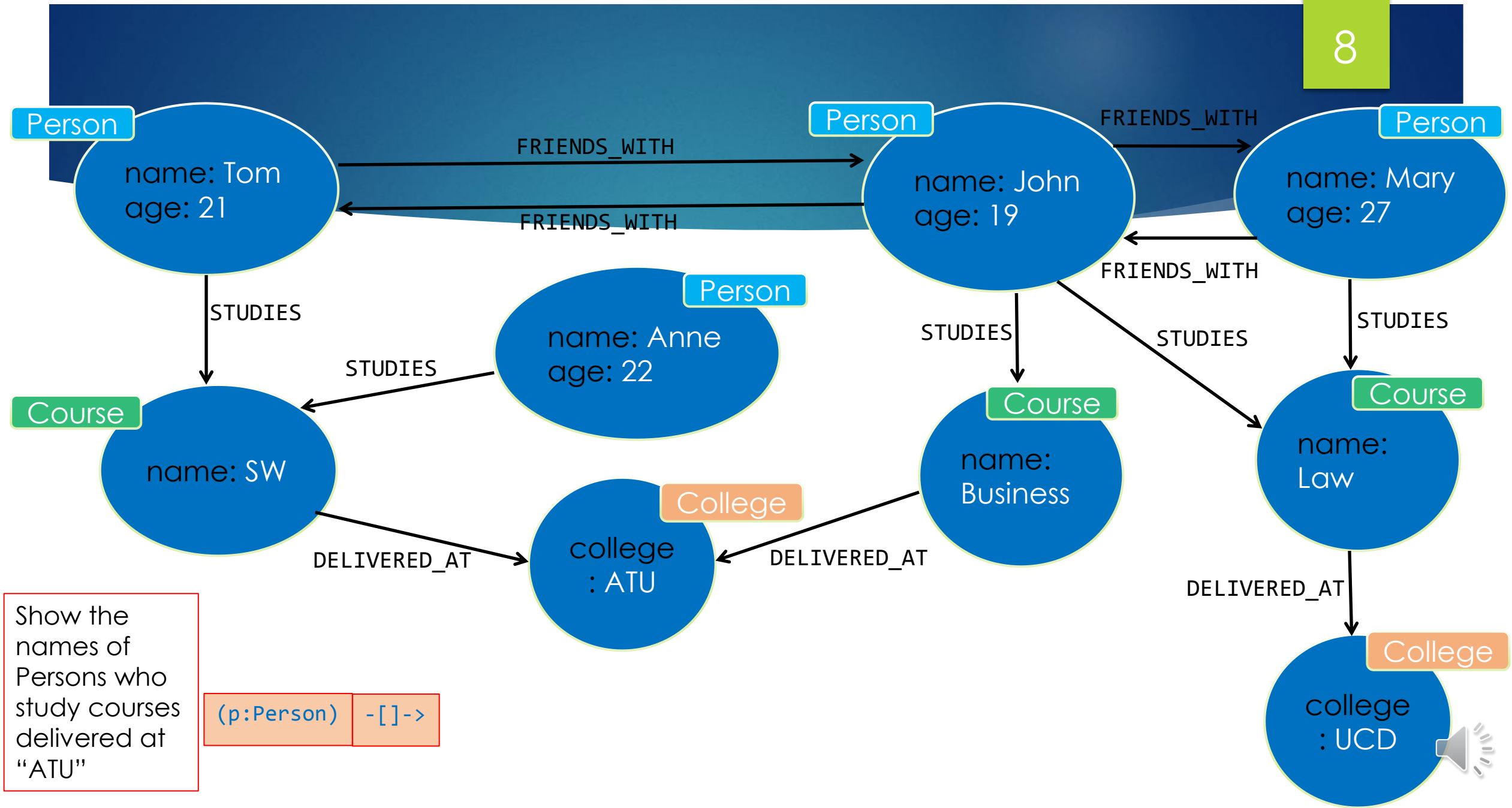
Show the names of Persons who study courses delivered at "ATU"

```
(:Person)
```



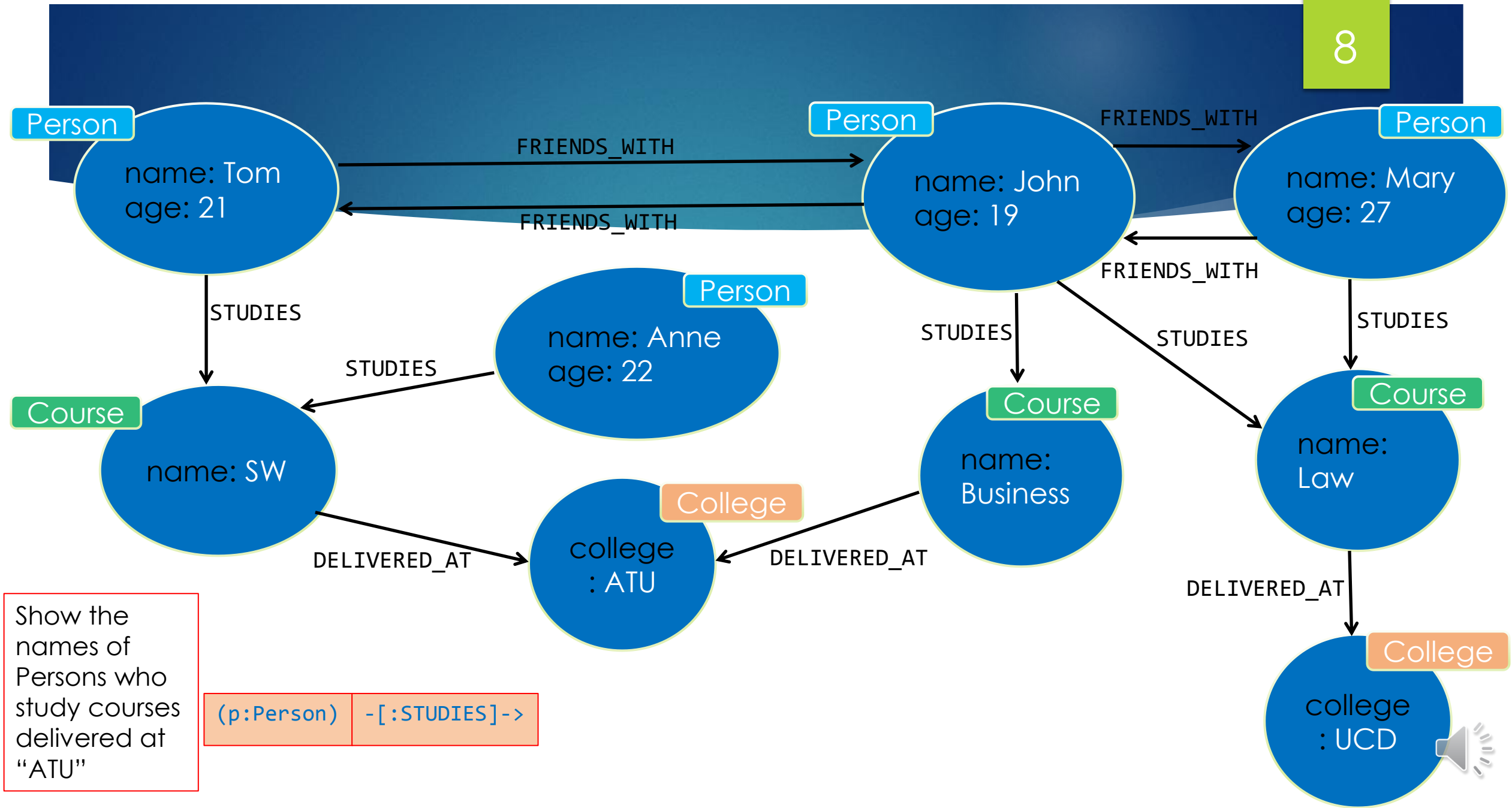
Show the names of Persons who study courses delivered at "ATU"

```
(p:Person)
```



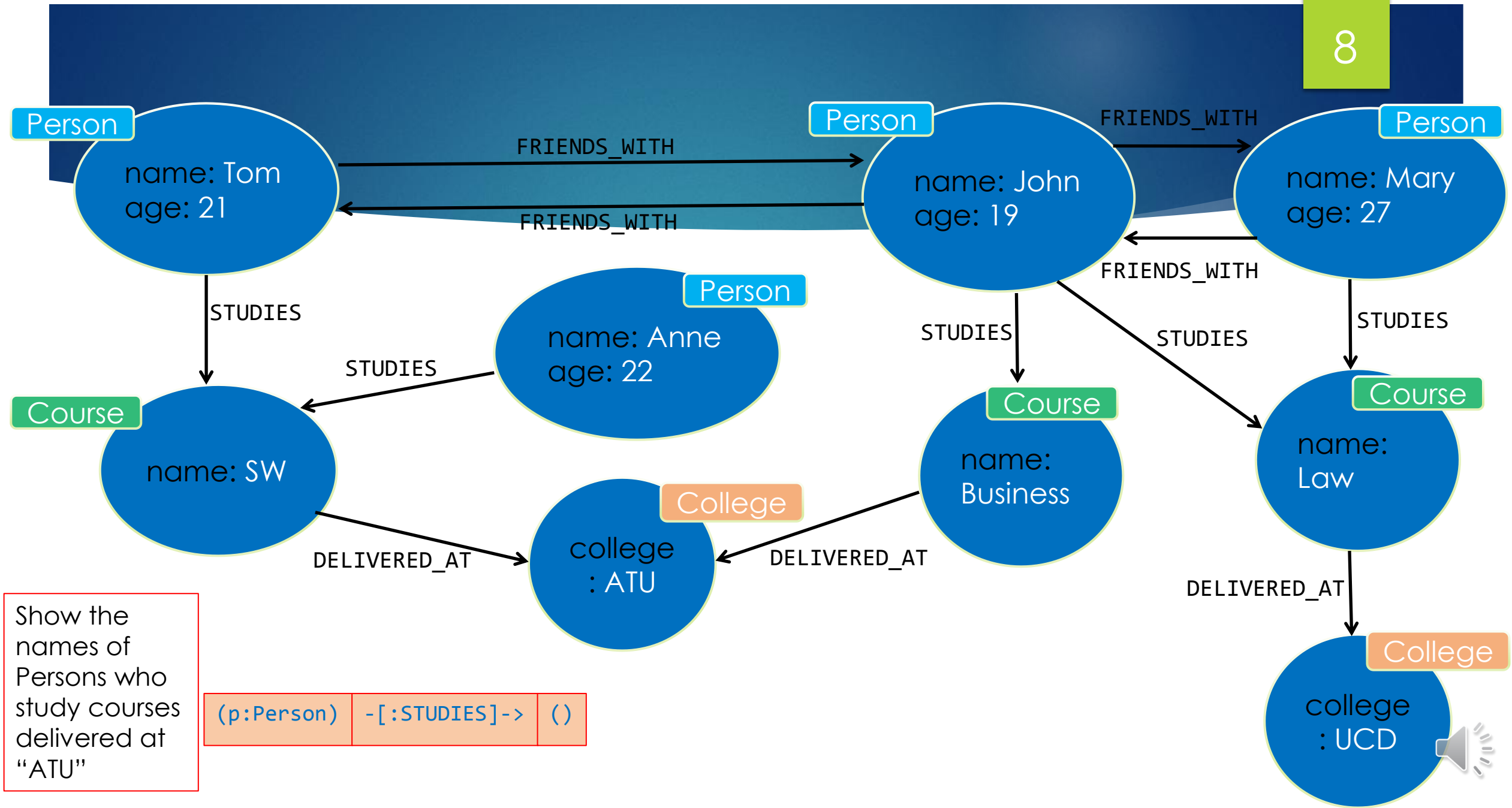
Show the names of Persons who study courses delivered at "ATU"

```
(p:Person) -[]->
```



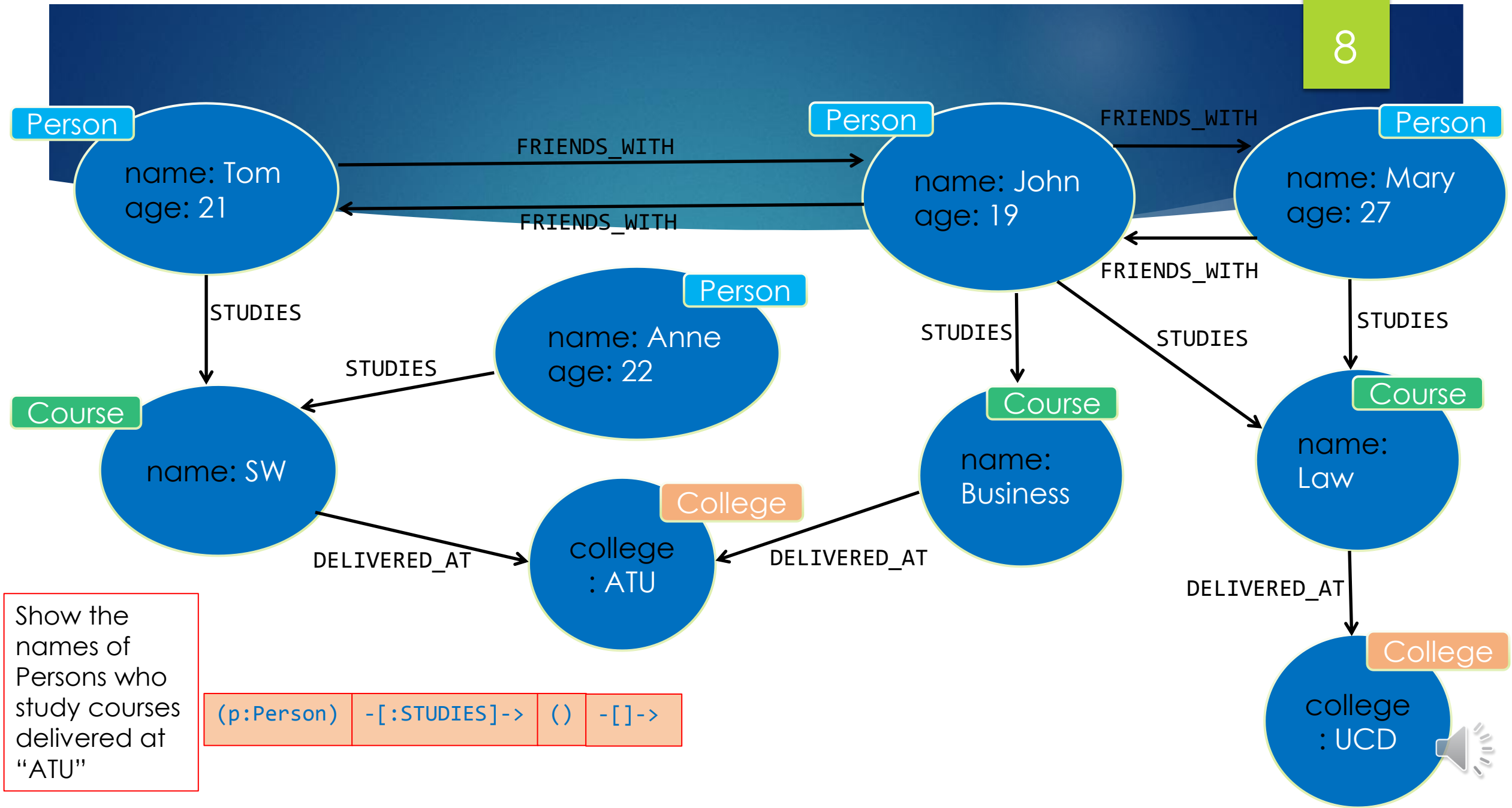
Show the names of Persons who study courses delivered at "ATU"

```
(p:Person)  -[:STUDIES]->
```



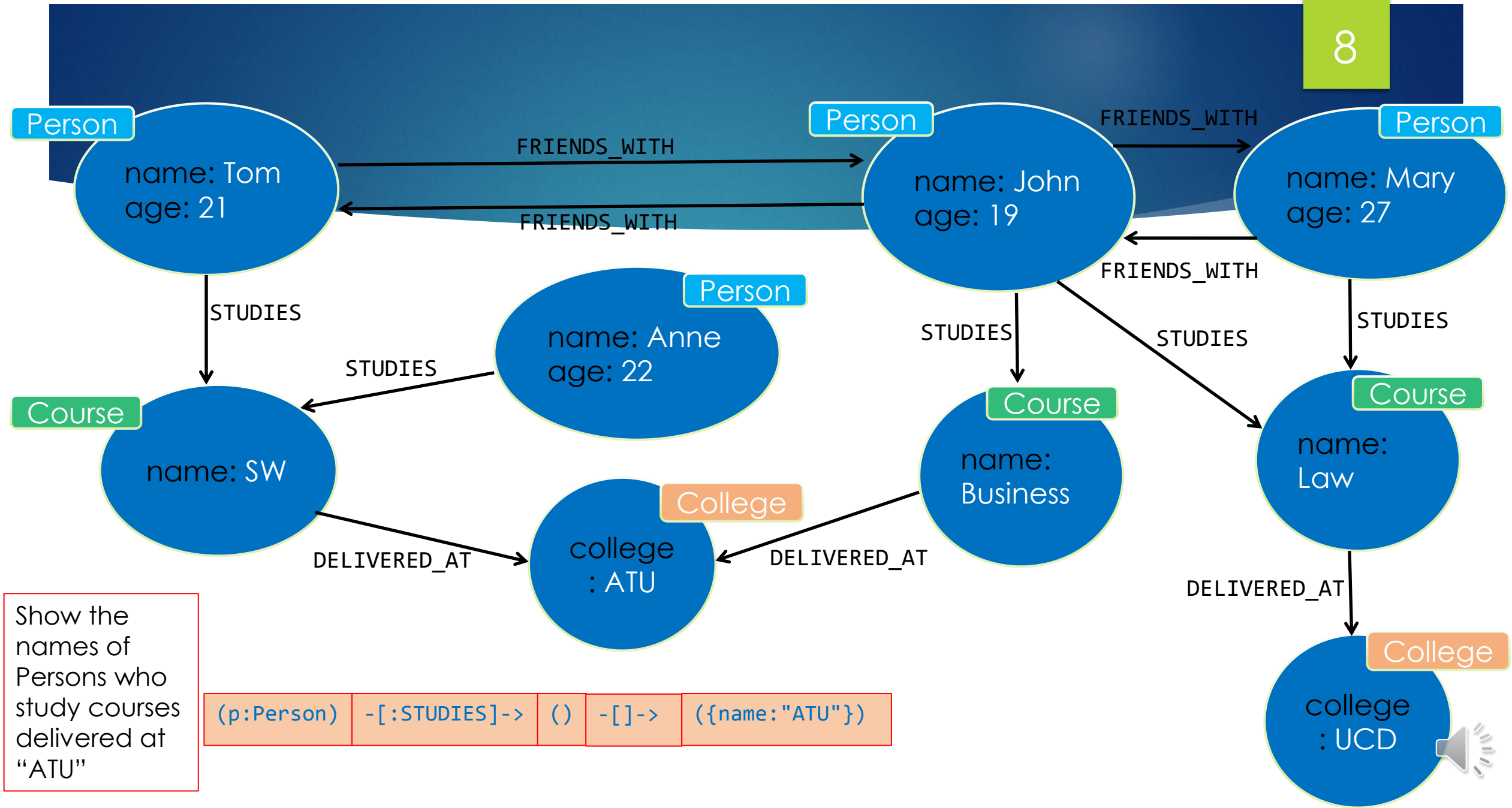
Show the names of Persons who study courses delivered at "ATU"

```
(p:Person) | -[:STUDIES]-> | ()
```



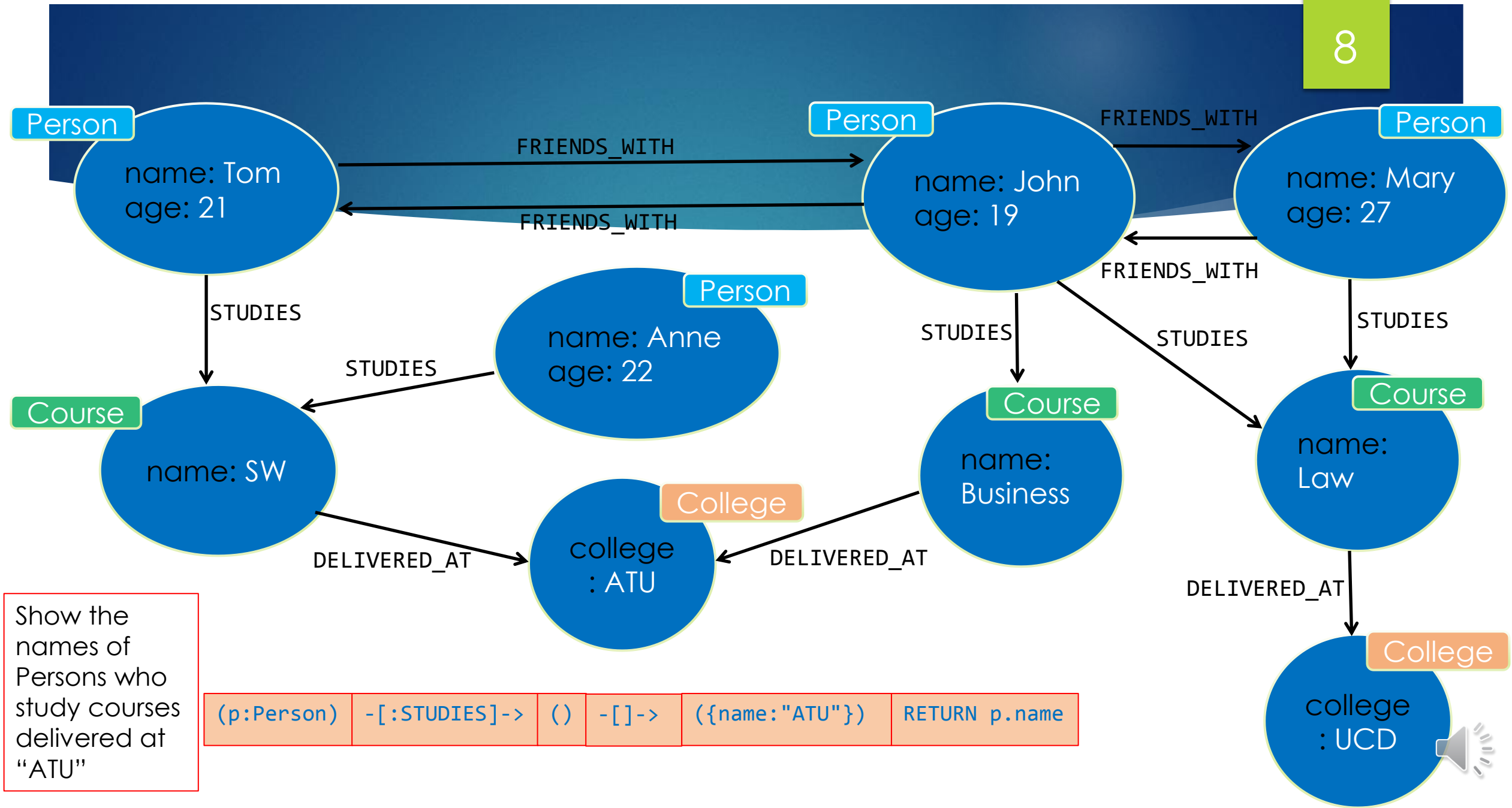
Show the names of Persons who study courses delivered at "ATU"

```
(p:Person) | -[:STUDIES]-> | () | -[]->
```



Show the names of Persons who study courses delivered at "ATU"

```
(p:Person) | -[:STUDIES]-> | () | -[]-> | ({name:"ATU"})
```



Show the names of Persons who study courses delivered at "ATU"

```
(p:Person) -[:STUDIES]-> () -[]-> ({name:"ATU"}) RETURN p.name
```

Relationships

```
MATCH(p:Person)
      -[:STUDIES]->
      ()
      -->
      ({name:"ATU"})
RETURN p.name
```

Relationships

Show the names of Persons who study courses delivered at "ATU"

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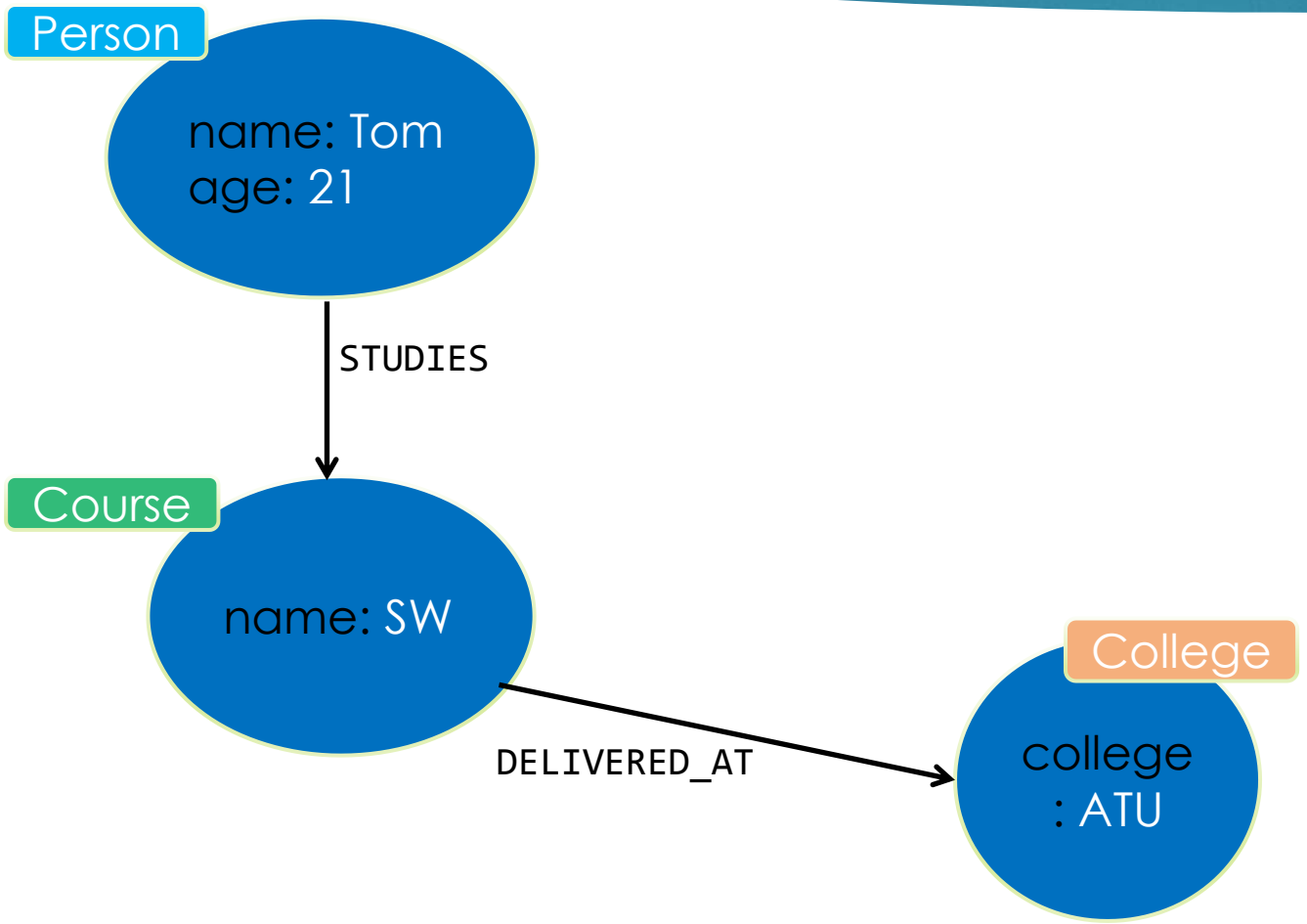
MATCH(p:Person)
      -[:STUDIES]->
      ()
      -->
      ({name:"ATU"})
RETURN p.name
```

Relationships



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      ()
      -->
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```
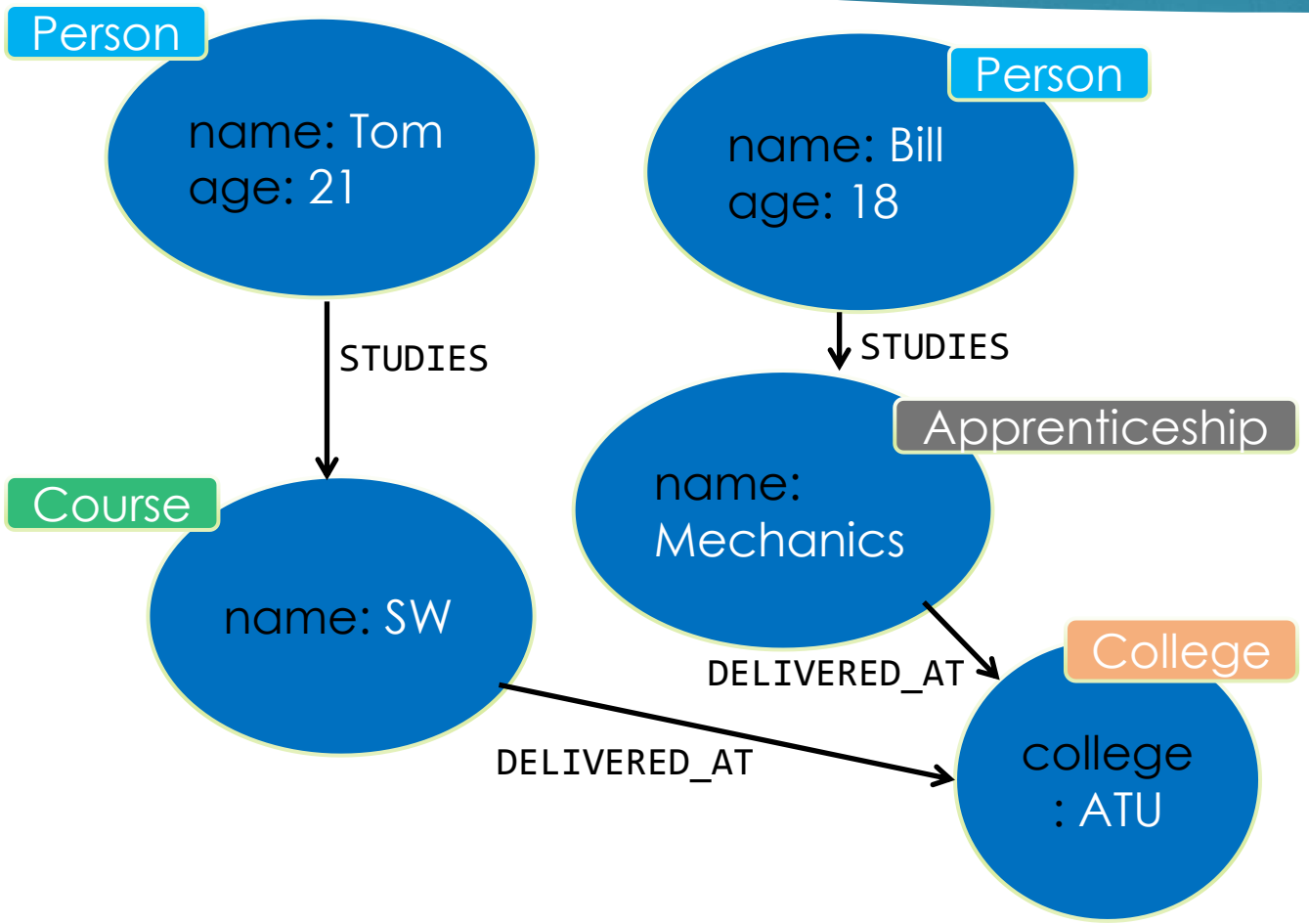

Relationships



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      ()
      -->
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RETURN p.name
```

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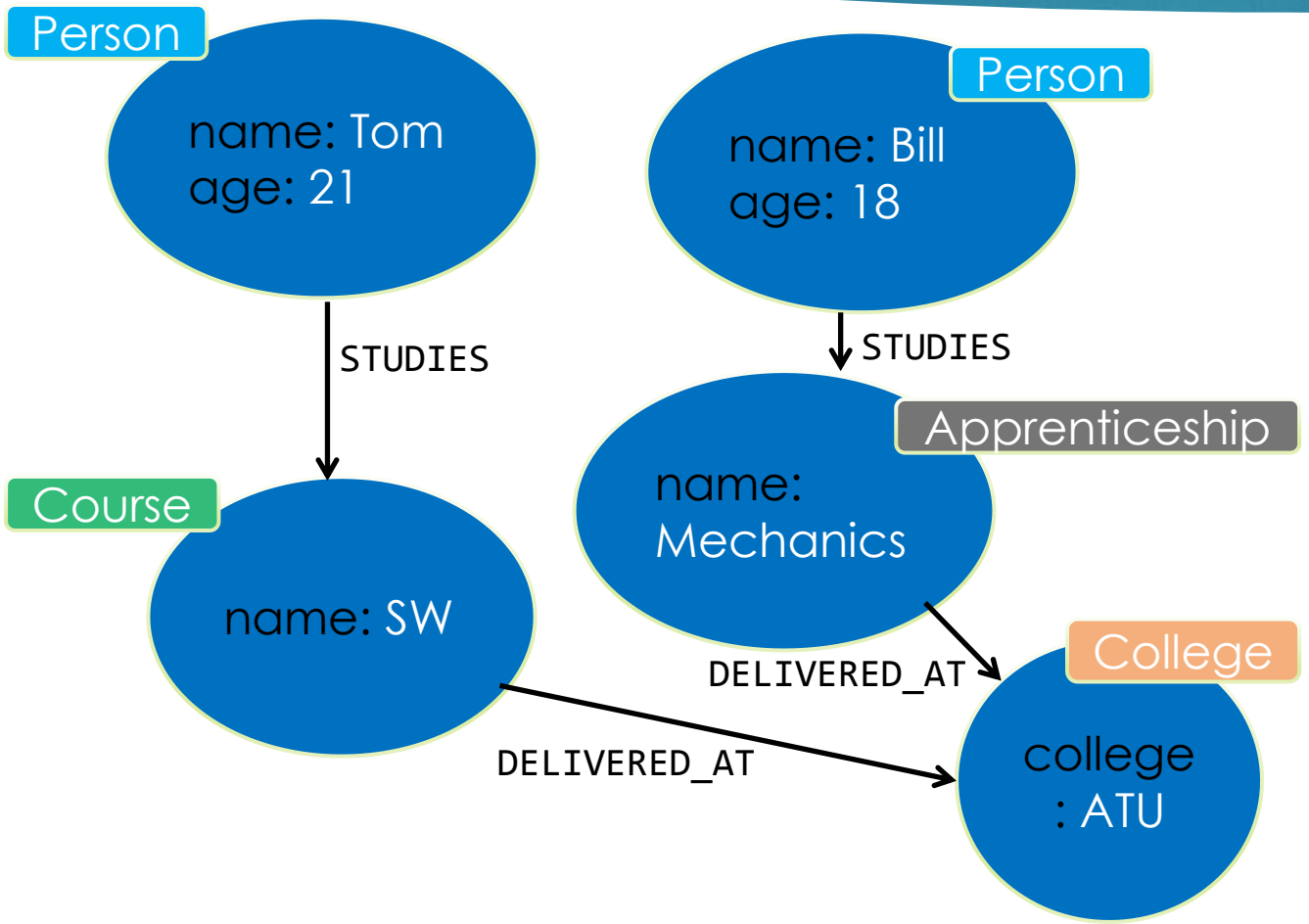

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MATCH(p:Person)
      -[:STUDIES]->
      ()
      -->
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RETURN p.name
```
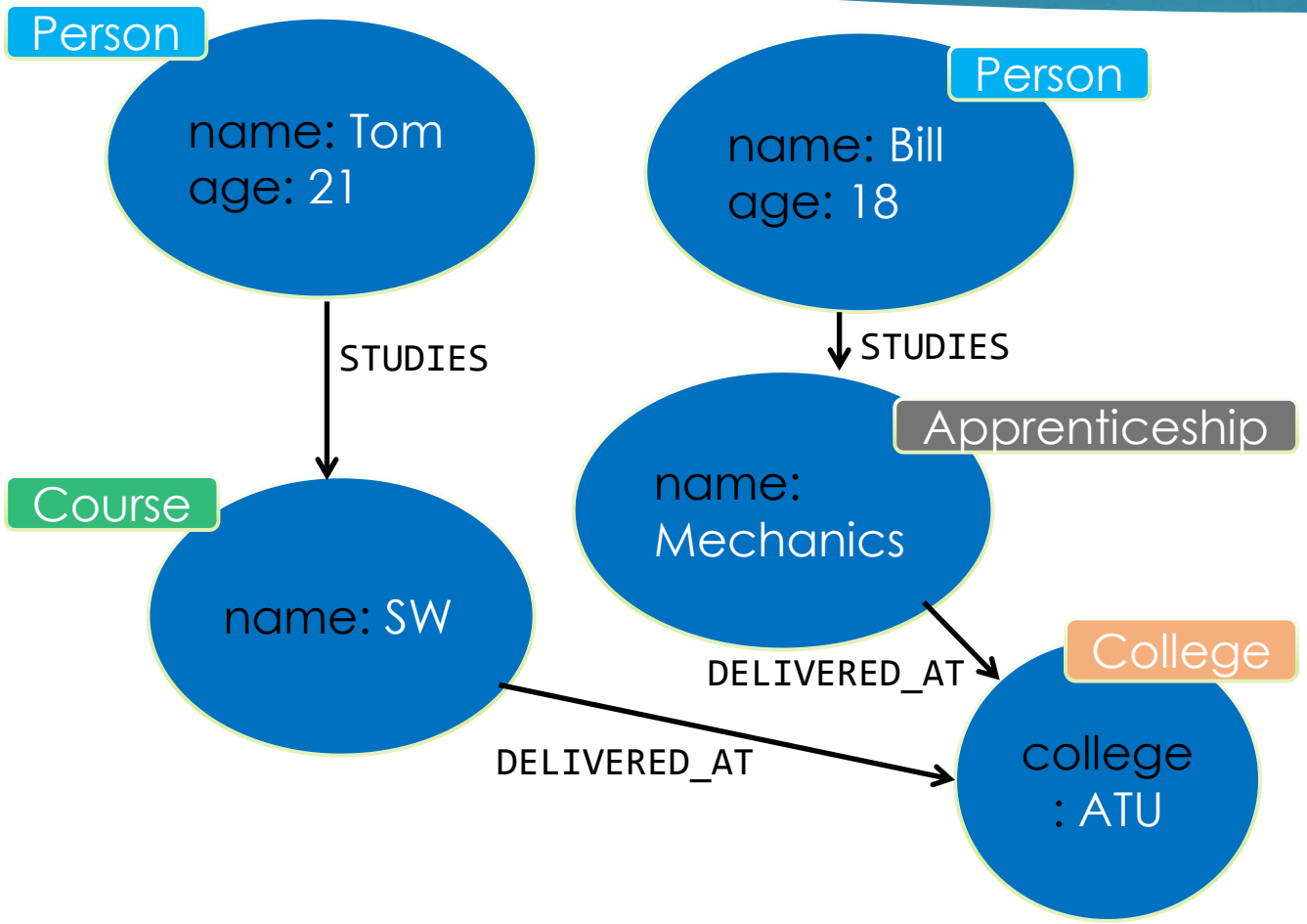
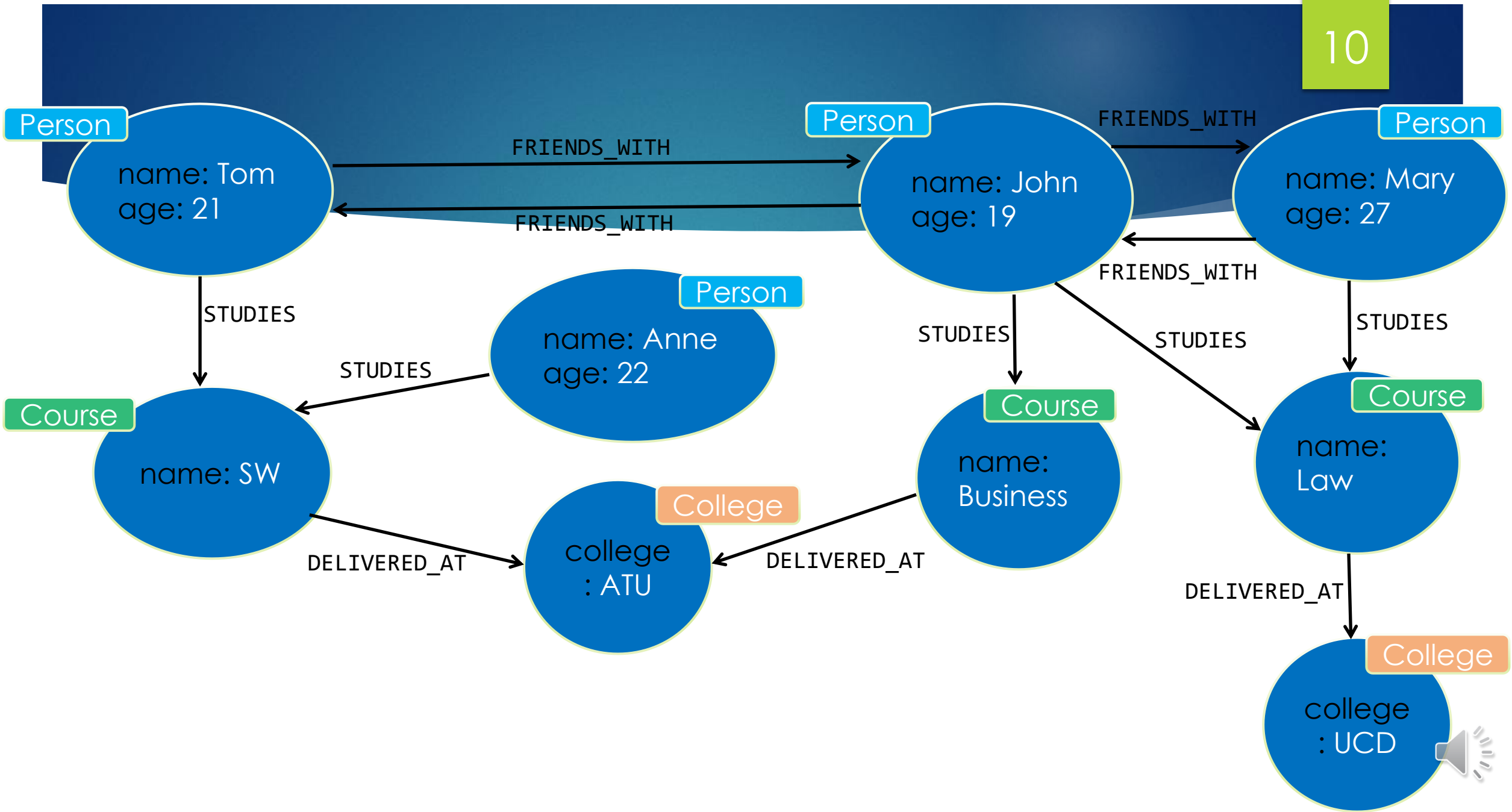

Relationships

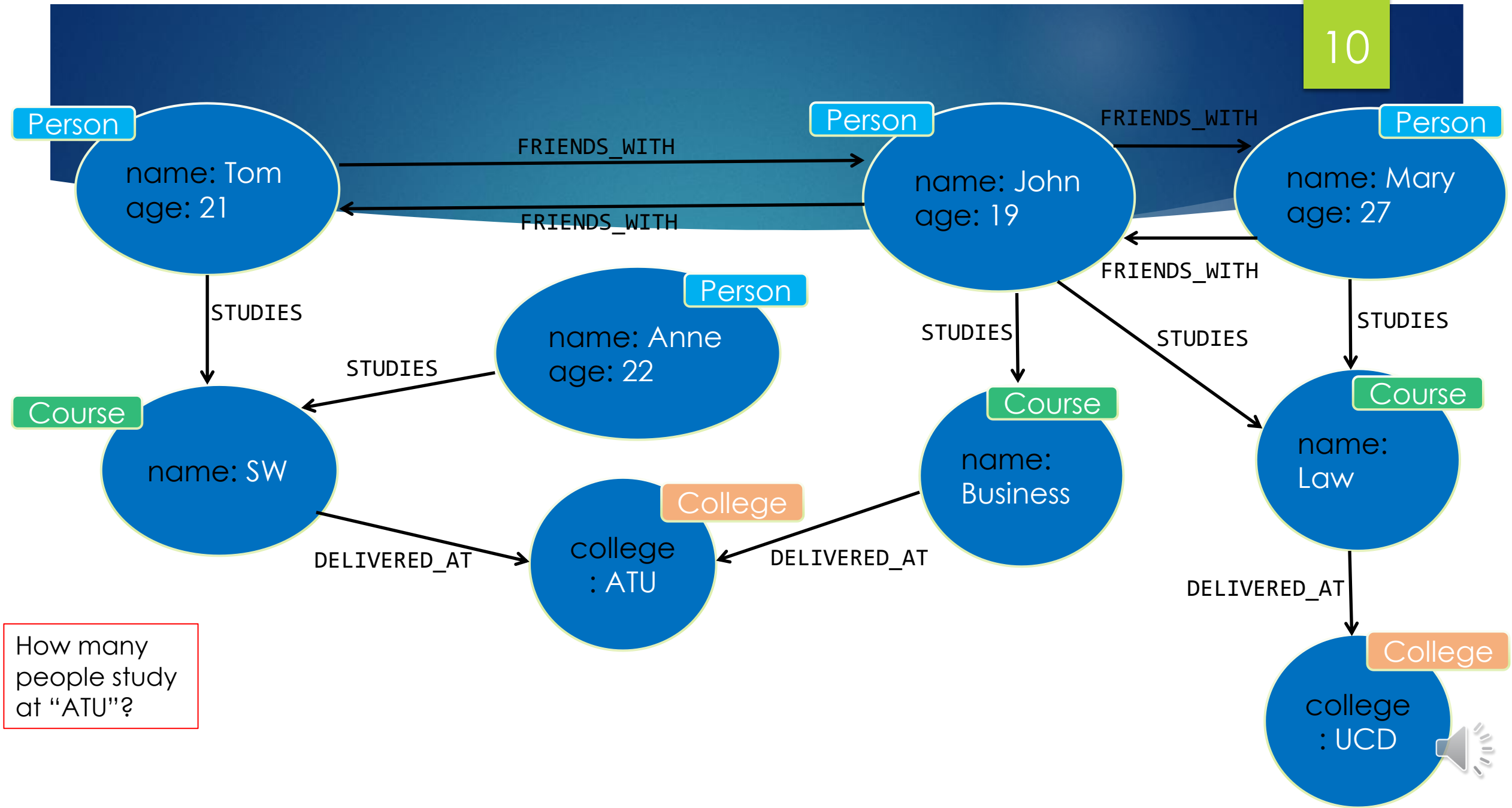


Show the names of Persons who study courses delivered at "ATU"

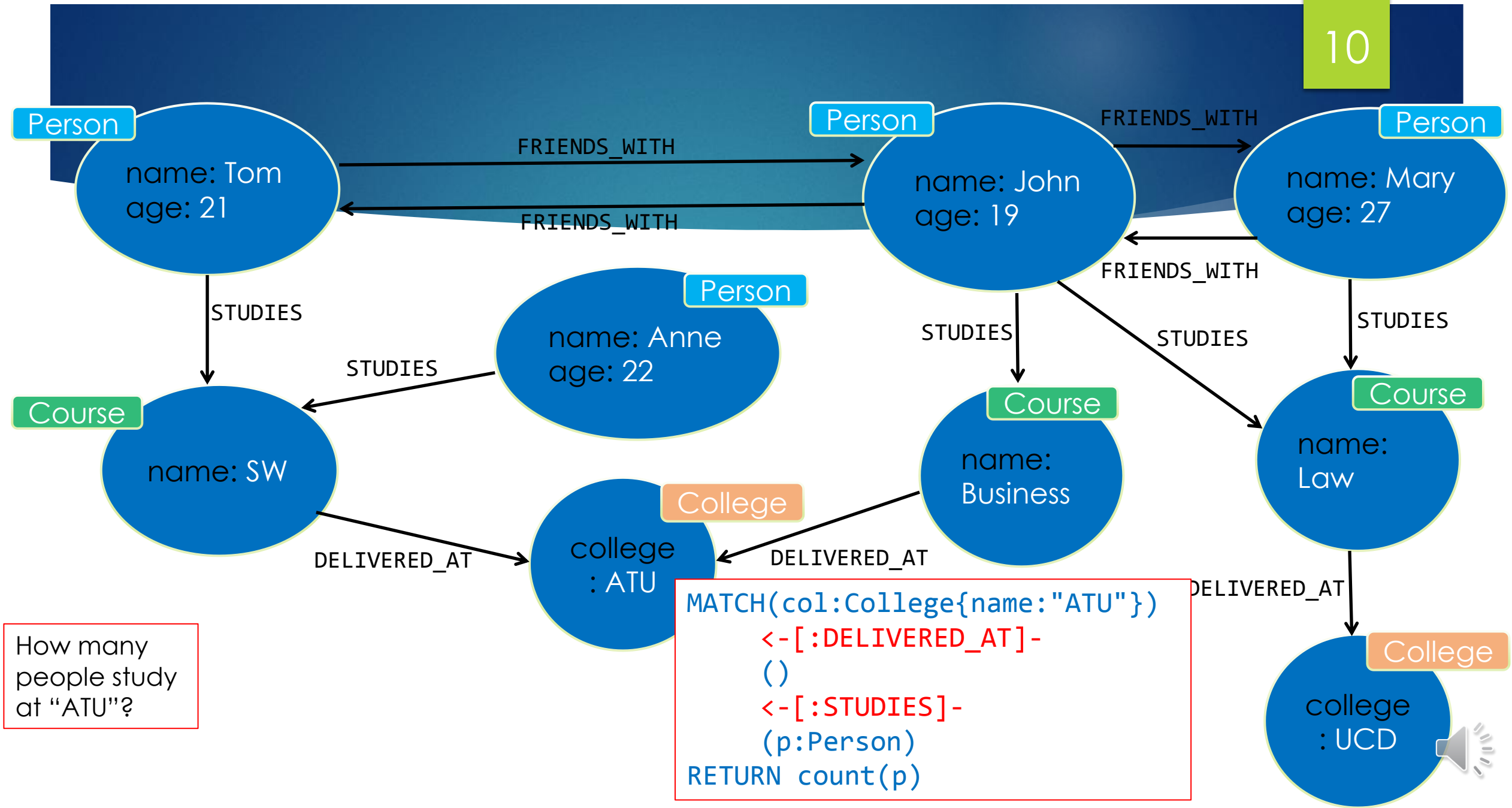
```
MATCH(p:Person)
      -[:STUDIES]->
      ()
      -->
      ({name:"ATU"})
RETURN p.name
```

```
MATCH(p:Person)
      -[:STUDIES]->
      (c:Course)
      -[d:DELIVERED_AT]->
      (col:College{name:"ATU"})
RETURN p.name
```


Person
name: Tom
age: 21
FRIENDS_WITH
FRIENDS_WITH
Person
name: John
age: 19
FRIENDS_WITH
Person
name: Mary
age: 27
FRIENDS_WITH
STUDIES
Person
name: Anne
age: 22
STUDIES
STUDIES
STUDIES
STUDIES
Course
name: SW
Course
name:
Business
Course
name:
Law
College
college
: ATU
DELIVERED_AT
DELIVERED_AT
DELIVERED_AT
College
college
: UCD

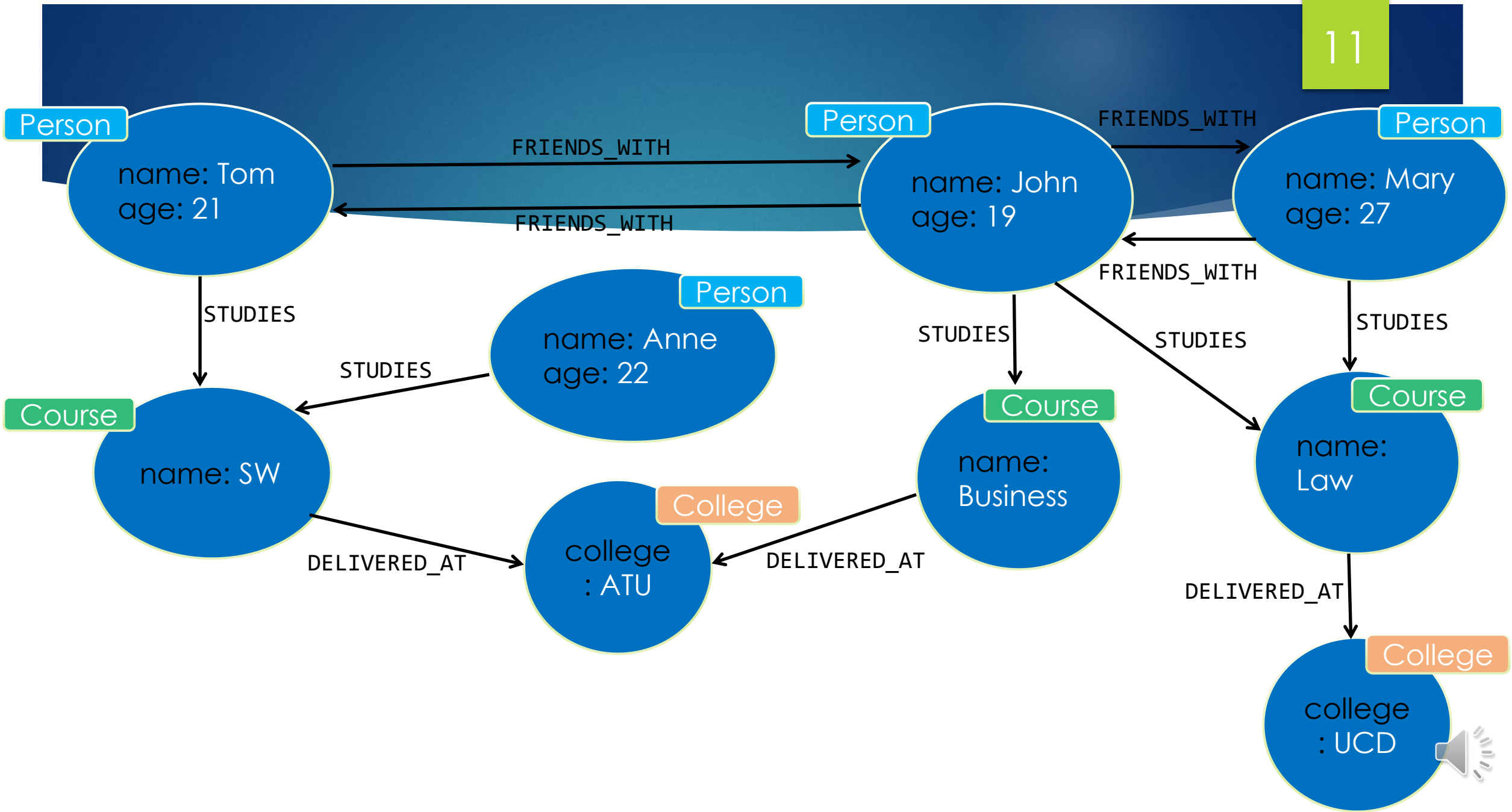


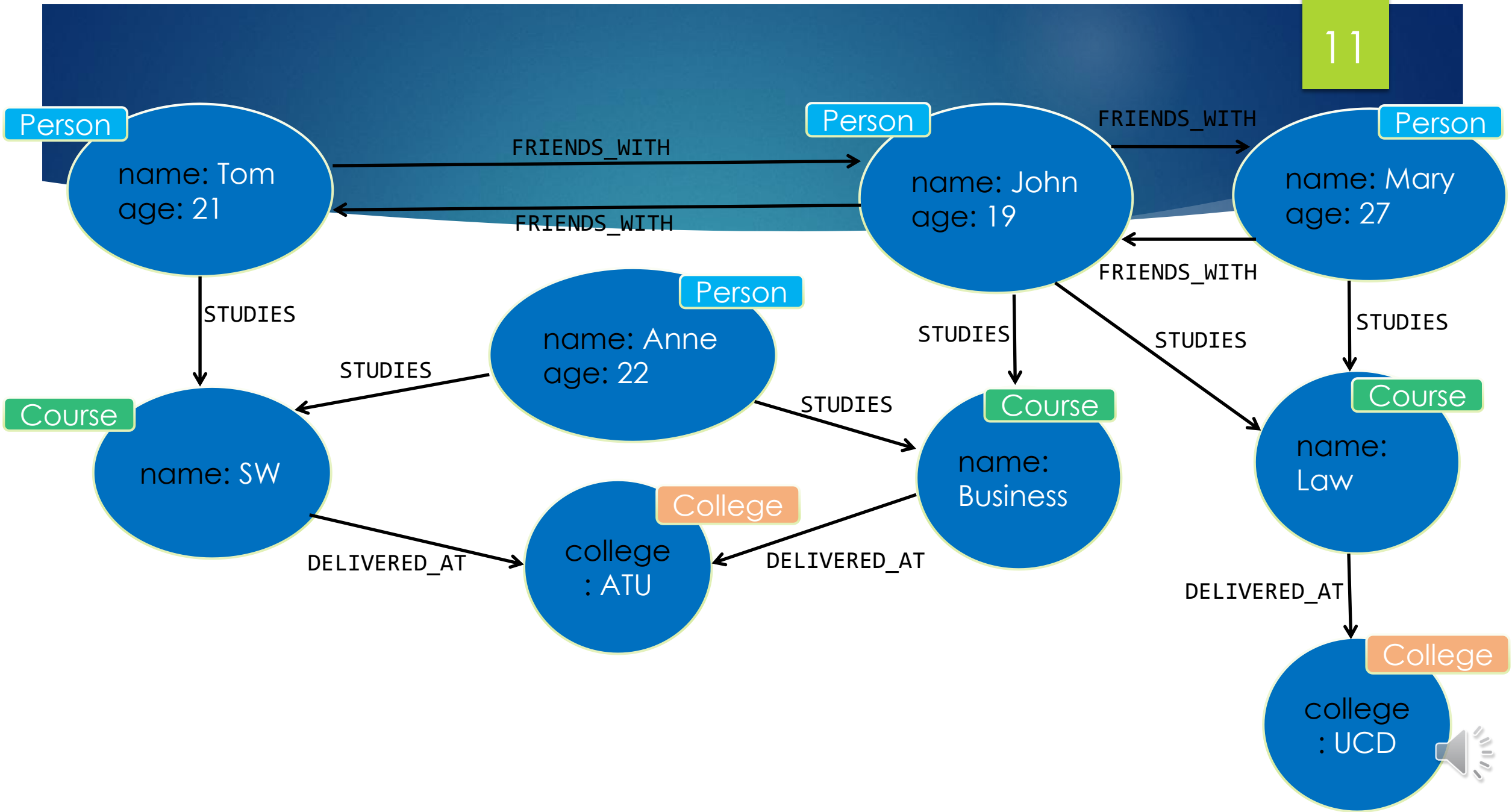
How many people study at "ATU"?

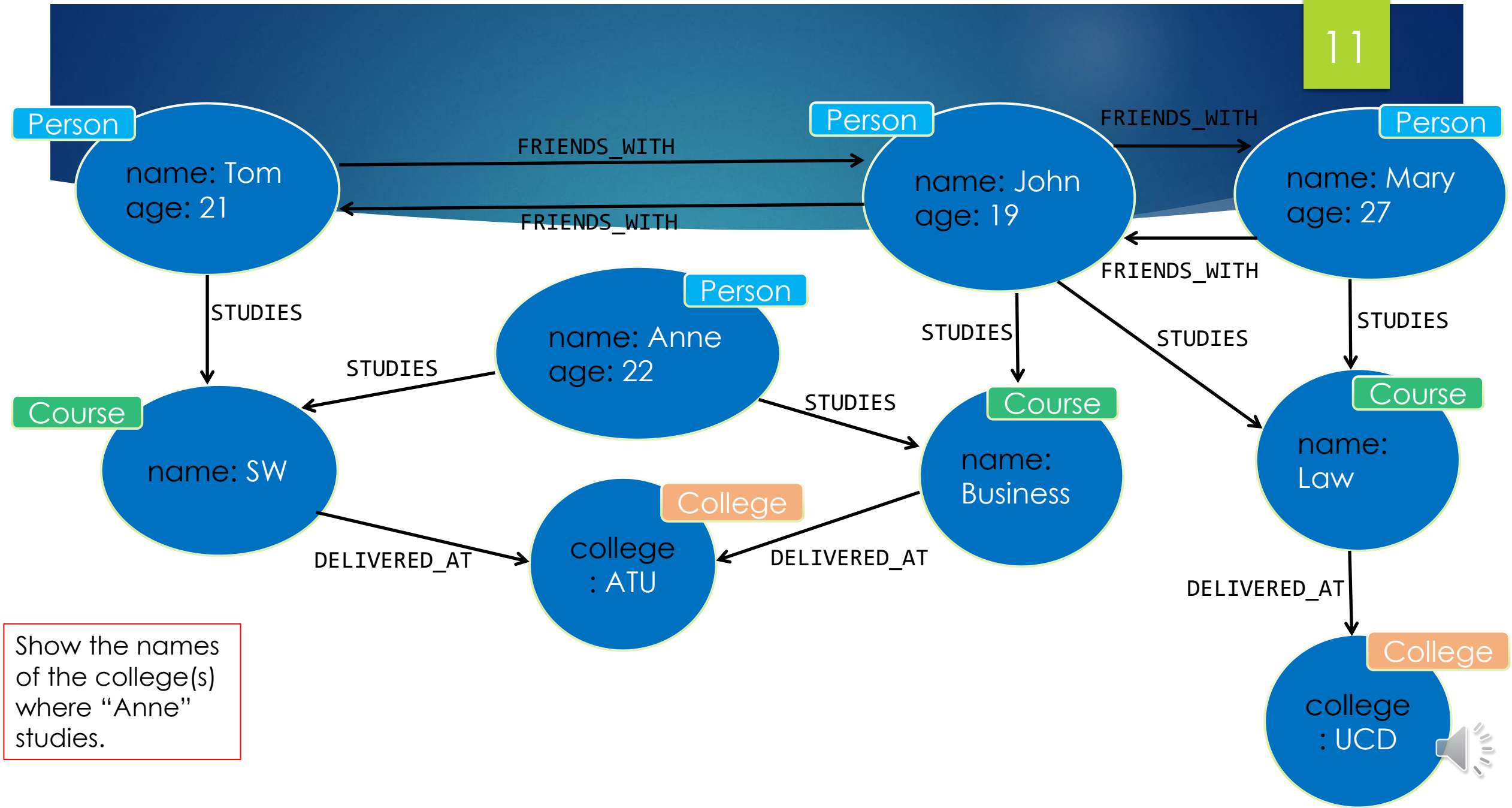


How many people study at "ATU"?

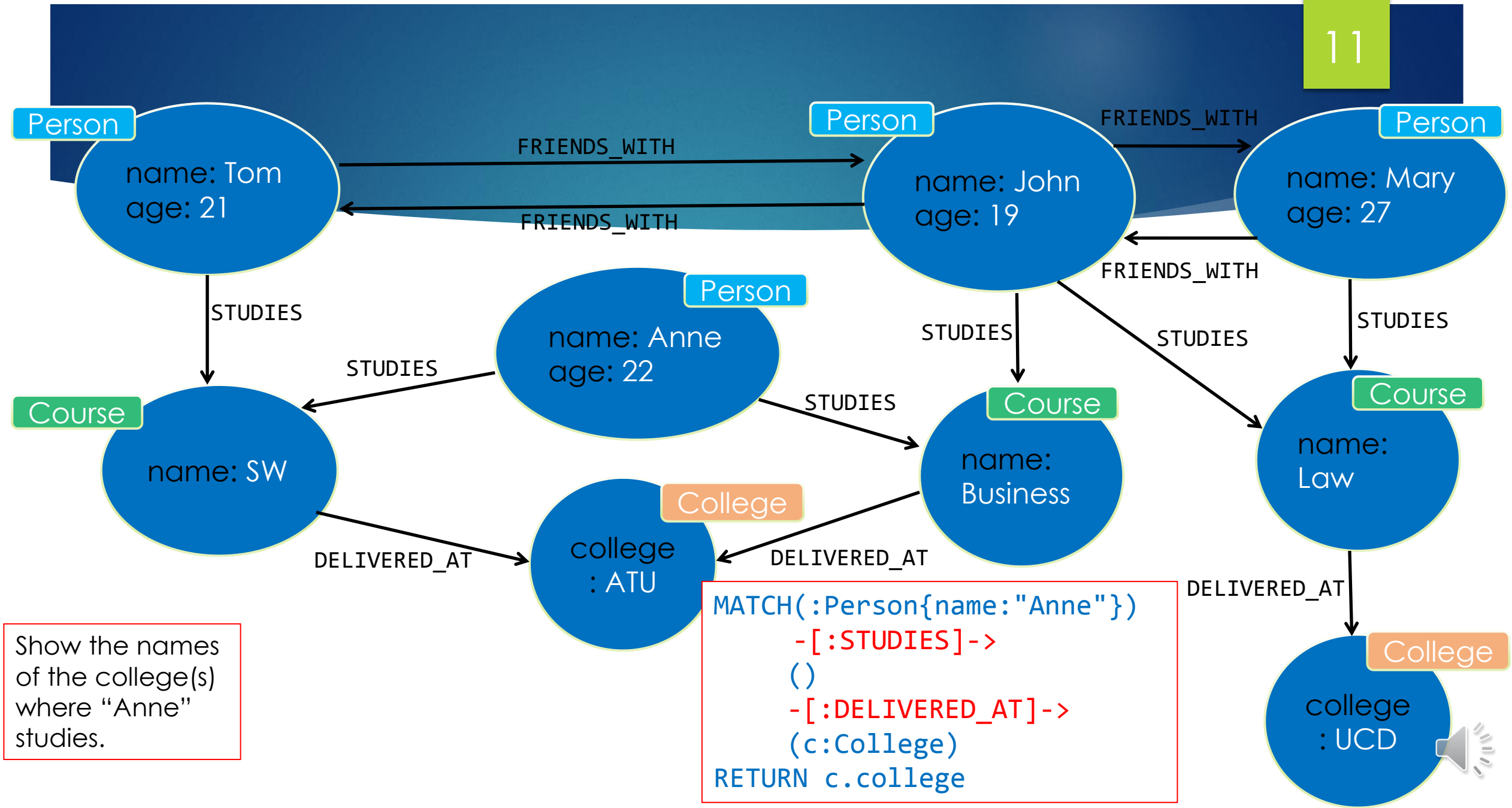
```
MATCH(col:College{name:"ATU"})
      <-[:DELIVERED_AT]-
      ()
      <-[:STUDIES]-
      (p:Person)
RETURN count(p)
```


Person
name: Tom
age: 21
FRIENDS_WITH
FRIENDS_WITH
Person
name: John
age: 19
FRIENDS_WITH
Person
name: Mary
age: 27
FRIENDS_WITH
STUDIES
Person
name: Anne
age: 22
STUDIES
STUDIES
STUDIES
STUDIES
Course
name: SW
Course
name:
Business
Course
name:
Law
College
college
: ATU
DELIVERED_AT
DELIVERED_AT
DELIVERED_AT
College
college
: UCD


Person
name: Tom
age: 21
FRIENDS_WITH
FRIENDS_WITH
Person
name: John
age: 19
FRIENDS_WITH
Person
name: Mary
age: 27
FRIENDS_WITH
STUDIES
Person
name: Anne
age: 22
STUDIES
STUDIES
STUDIES
STUDIES
Course
name: SW
STUDIES
Course
name:
Business
Course
name:
Law
College
college
: ATU
DELIVERED_AT
DELIVERED_AT
DELIVERED_AT
College
college
: UCD

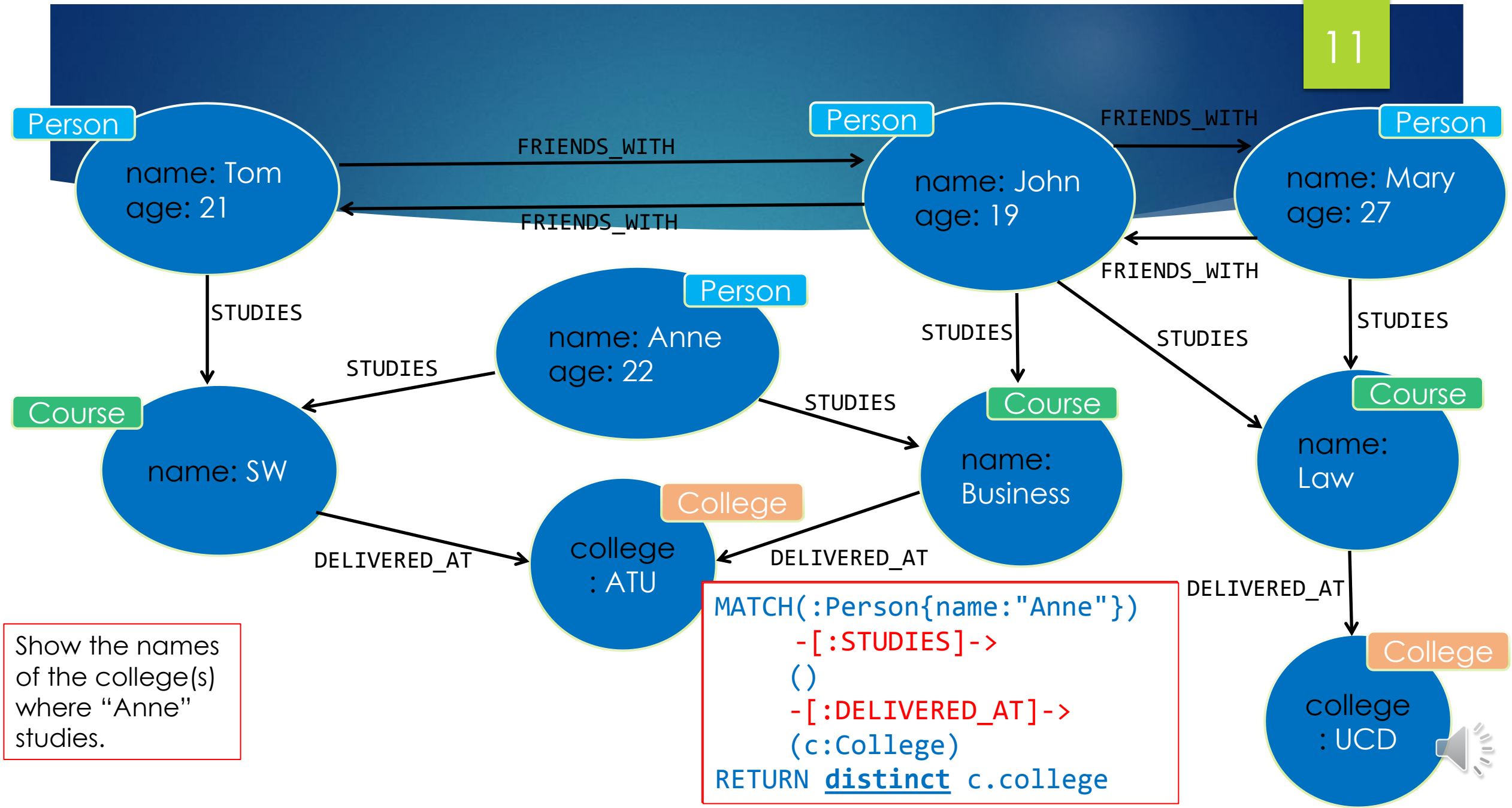


Show the names of the college(s) where "Anne" studies.



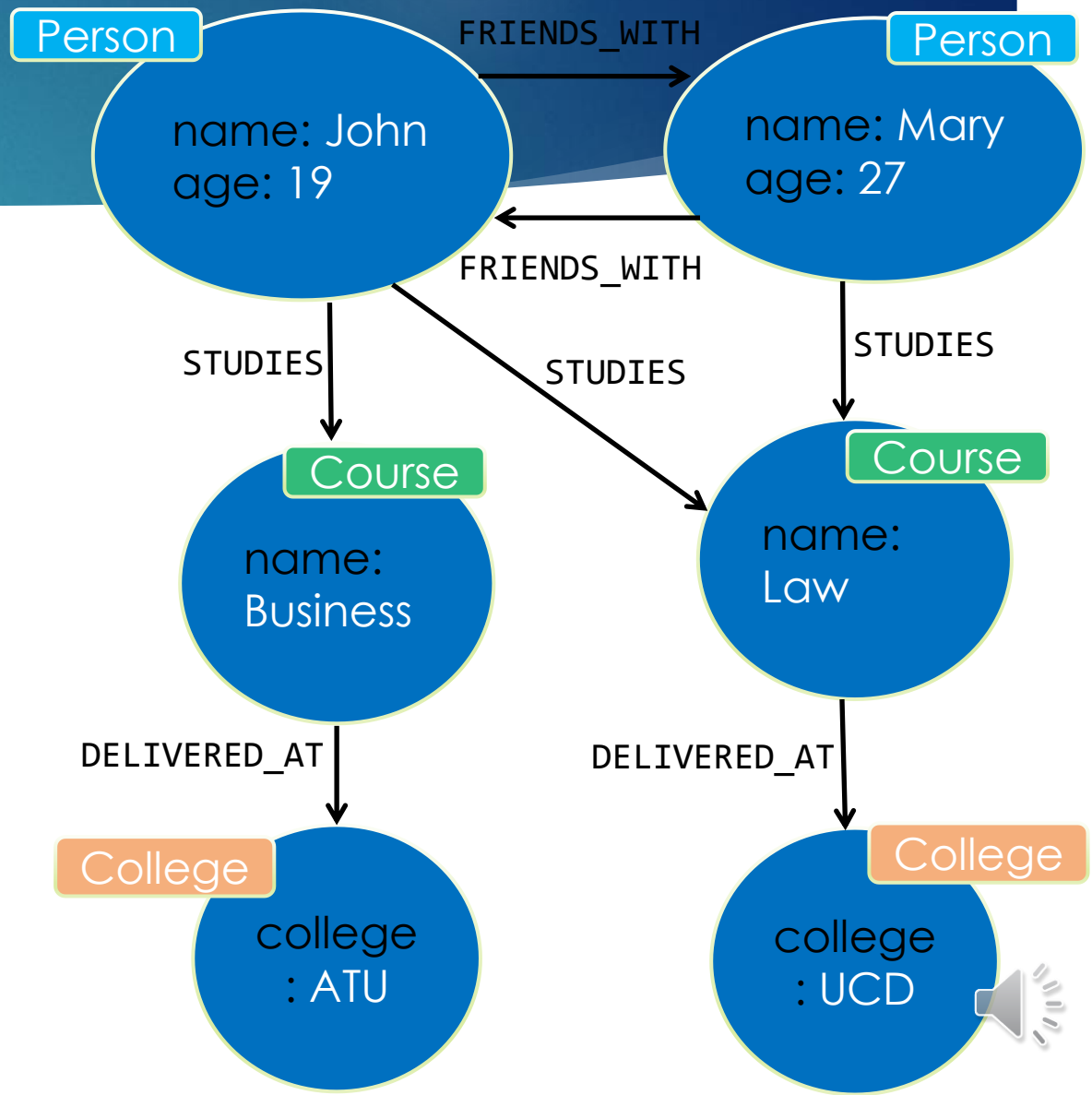
Show the names of the college(s) where "Anne" studies.

```
MATCH(:Person{name:"Anne"})
      -[:STUDIES]->
      ()
      -[:DELIVERED_AT]->
      (c:College)
RETURN c.college
```

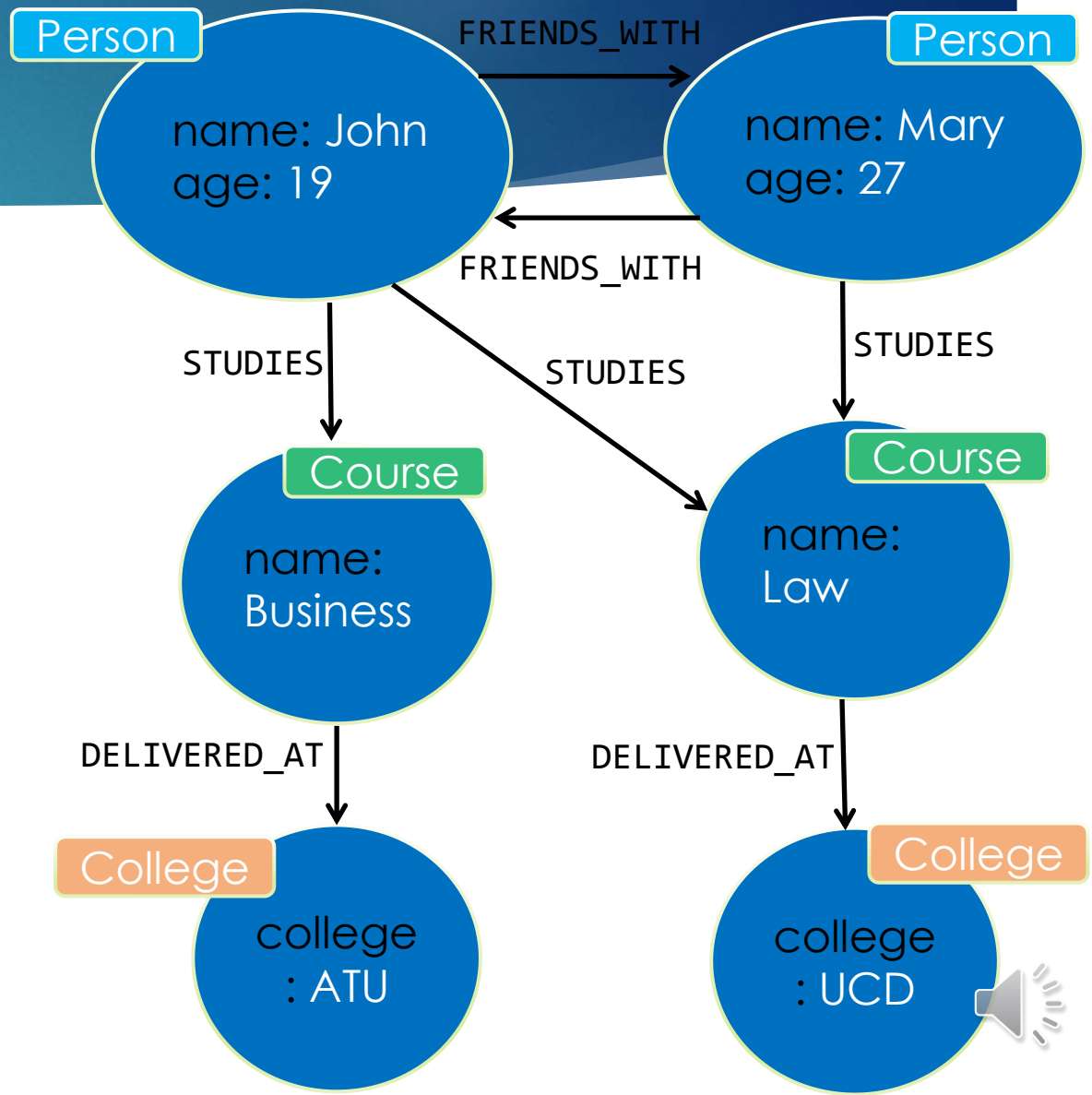


Show the names of the college(s) where "Anne" studies.

```
MATCH(:Person{name:"Anne"})
      -[:STUDIES]->
      ()
      -[:DELIVERED_AT]->
      (c:College)
RETURN distinct c.college
```


Person
name: John
age: 19
FRIENDS_WITH
Person
name: Mary
age: 27
FRIENDS_WITH
STUDIES
STUDIES
STUDIES
Course
name:
Business
Course
name:
Law
DELIVERED_AT
DELIVERED_AT
College
college
: ATU
College
college
: UCD

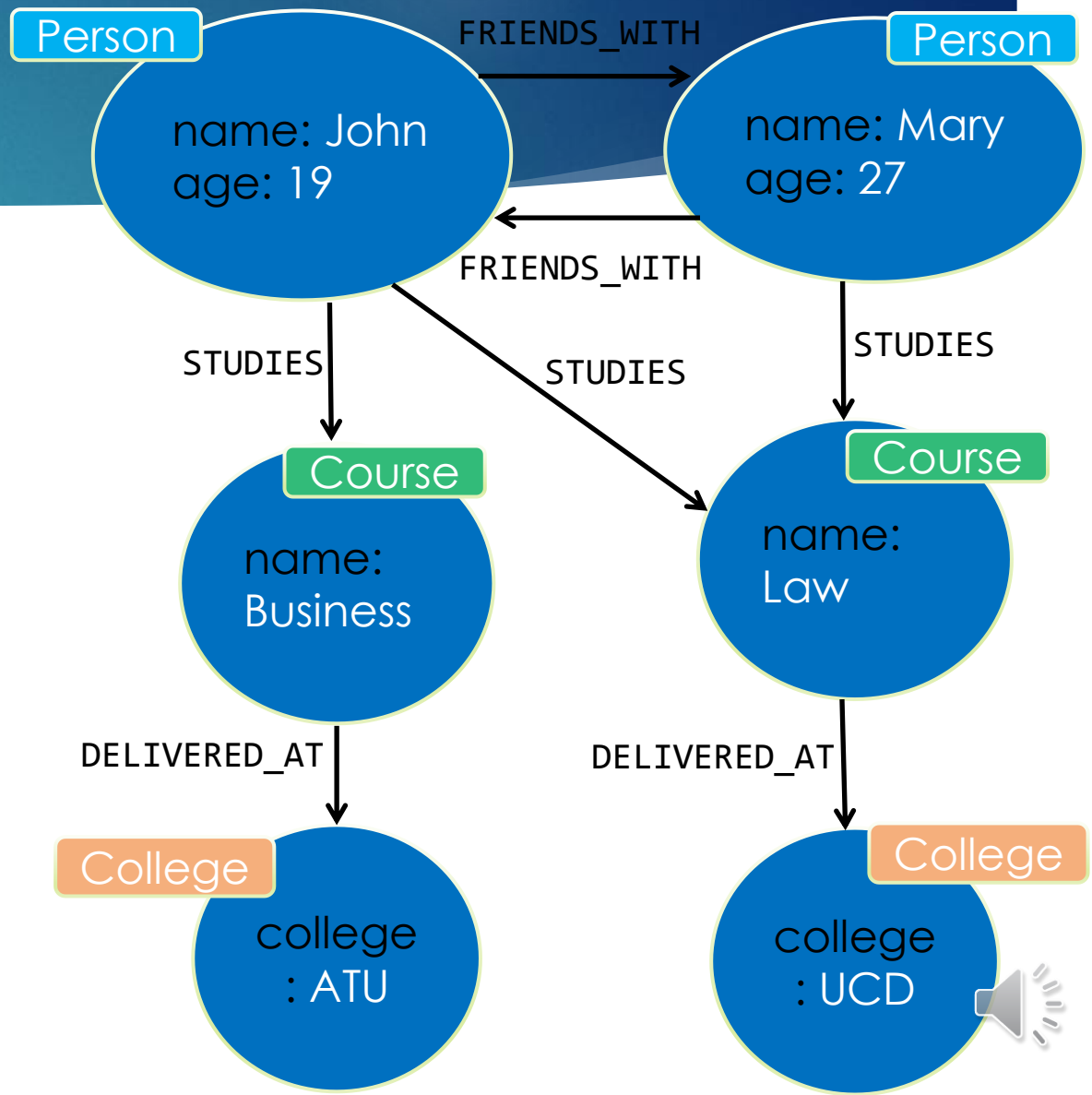
Show the Person's name and the name of the course(s) he/she studies.



Show the Person's name and the name of the course(s) he/she studies.

```
MATCH(n:Person)
      -[:STUDIES]->
      (c:Course)
RETURN n.name as Name,
       c.name as Courses
```

"Name"	"Courses"
"Tom"	"SW"
"John"	"Law"
"John"	"Business"
"Anne"	"SW"
"Mary"	"Law"



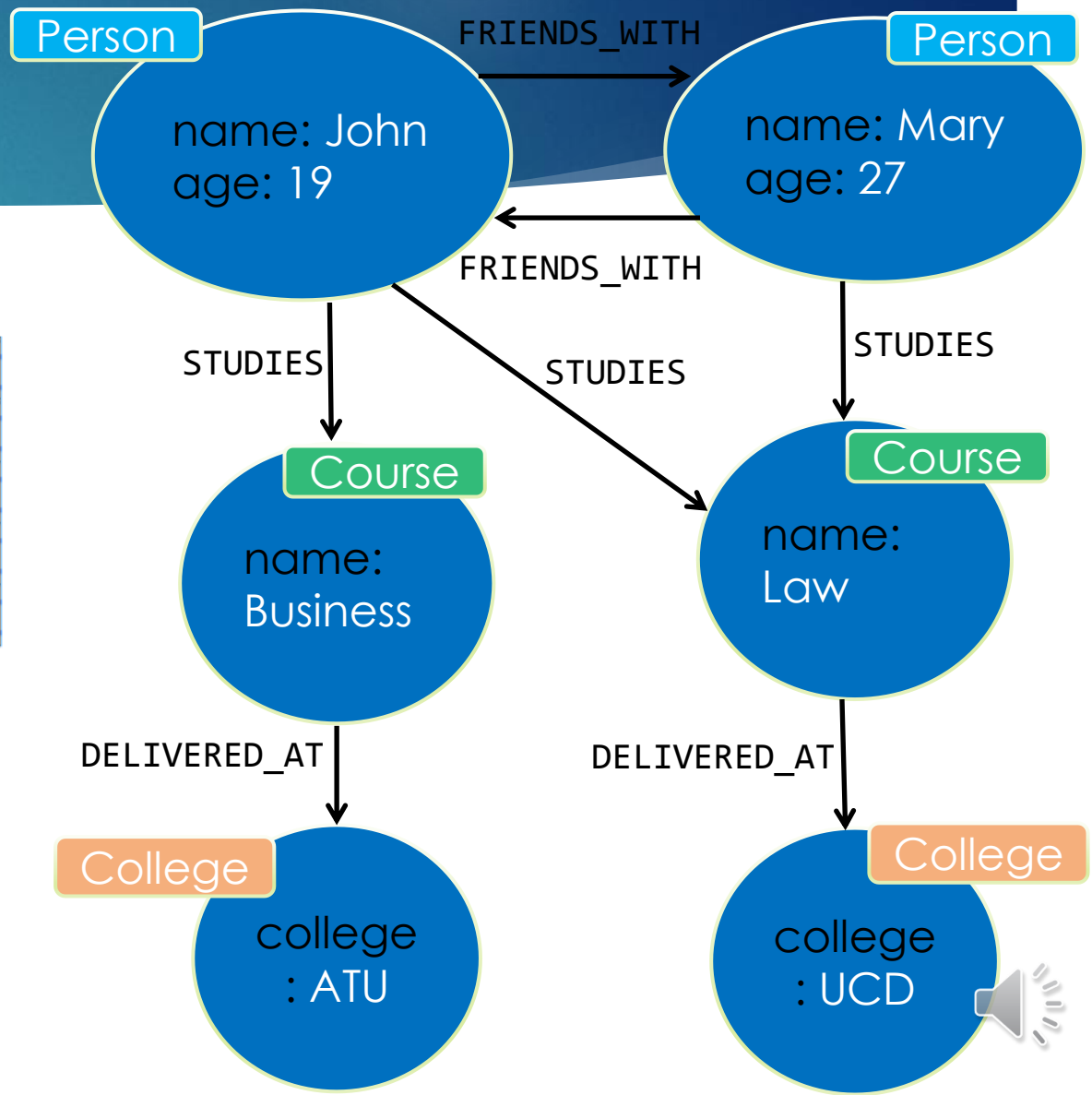
Show the Person's name and the name of the course(s) he/she studies.

```
MATCH(n:Person)
      -[:STUDIES]->
      (c:Course)
RETURN n.name as Name,
       c.name as Courses
```

"Name"	"Courses"
"Tom"	"SW"
"John"	"Law"
"John"	"Business"
"Anne"	"SW"
"Mary"	"Law"

```
MATCH(n:Person)
      -[:STUDIES]->
      (c:Course)
RETURN n.name as Name,
collect(c.name) as Courses
```

"Name"	"Courses"
"Tom"	["SW"]
"John"	["Law","Business"]
"Anne"	["SW"]
"Mary"	["Law"]



Show the Person's name and the name of the course(s) he/she studies.

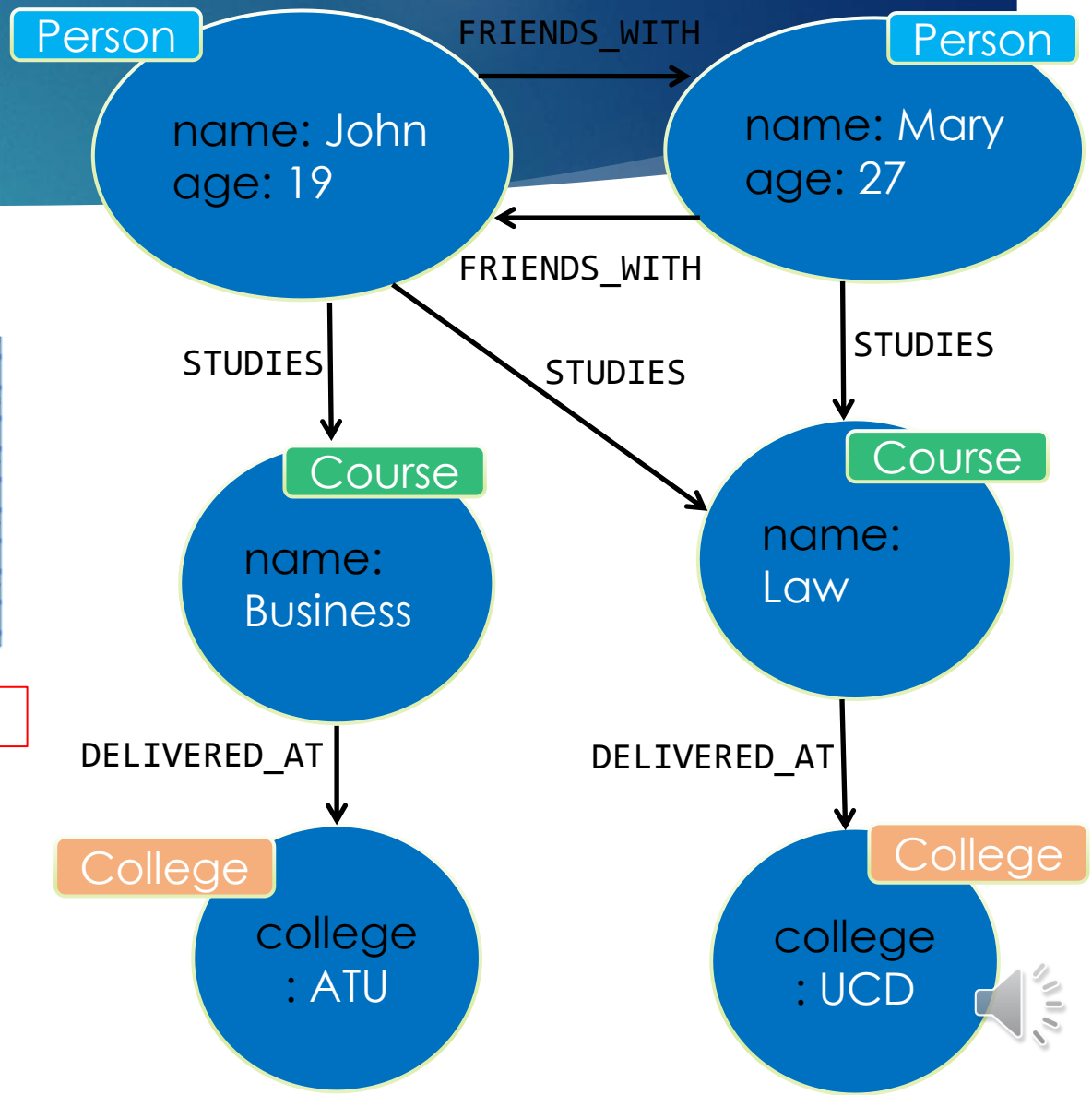
```
MATCH(n:Person)
      -[:STUDIES]->
      (c:Course)
RETURN n.name as Name,
       c.name as Courses
```

"Name"	"Courses"
"Tom"	"SW"
"John"	"Law"
"John"	"Business"
"Anne"	"SW"
"Mary"	"Law"

```
MATCH(n:Person)
      -[:STUDIES]->
      (c:Course)
RETURN n.name as Name,
collect(c.name) as Courses
```

"Name"	"Courses"
"Tom"	["SW"]
"John"	["Law","Business"]
"Anne"	["SW"]
"Mary"	["Law"]

Show the Person's name and the number of the course(s) he/she studies.



Show the Person's name and the name of the course(s) he/she studies.

```
MATCH(n:Person)
      -[:STUDIES]->
      (c:Course)
RETURN n.name as Name,
       c.name as Courses
```

"Name"	"Courses"
"Tom"	"SW"
"John"	"Law"
"John"	"Business"
"Anne"	"SW"
"Mary"	"Law"

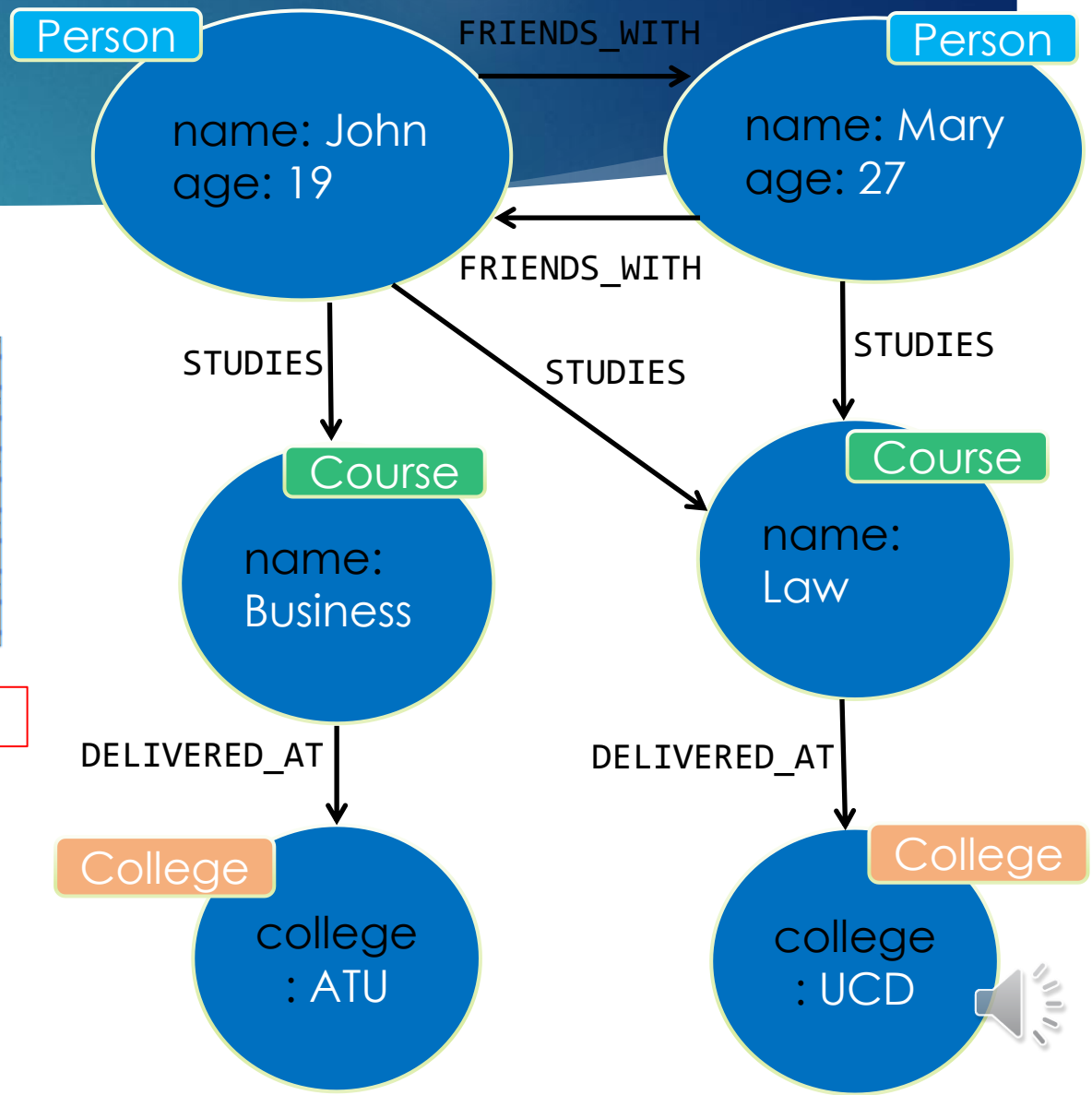
```
MATCH(n:Person)
      -[:STUDIES]->
      (c:Course)
RETURN n.name as Name,
collect(c.name) as Courses
```

"Name"	"Courses"
"Tom"	["SW"]
"John"	["Law","Business"]
"Anne"	["SW"]
"Mary"	["Law"]

Show the Person's name and the number of the course(s) he/she studies.

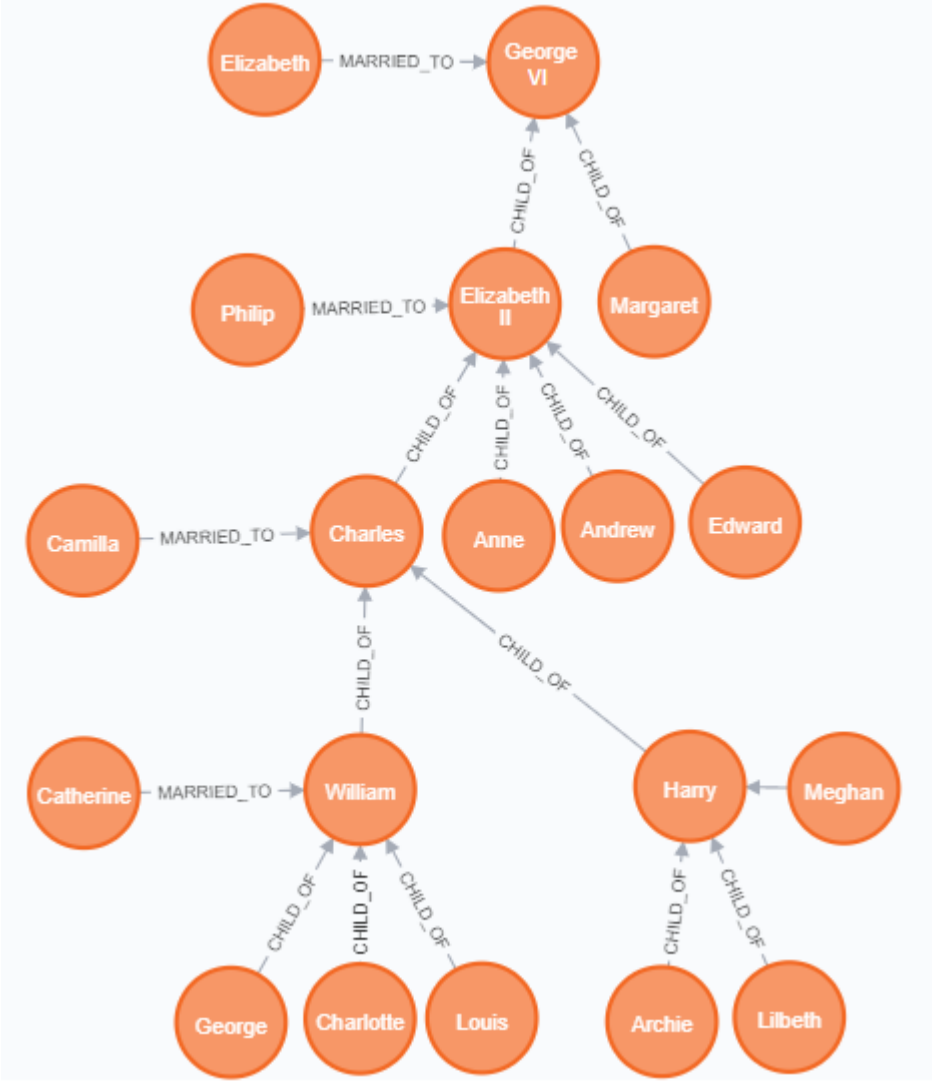
```
MATCH(n:Person)
      -[:STUDIES]->
      (c:Course)
RETURN n.name as Name,
size(collect(c.name)) as Courses
```

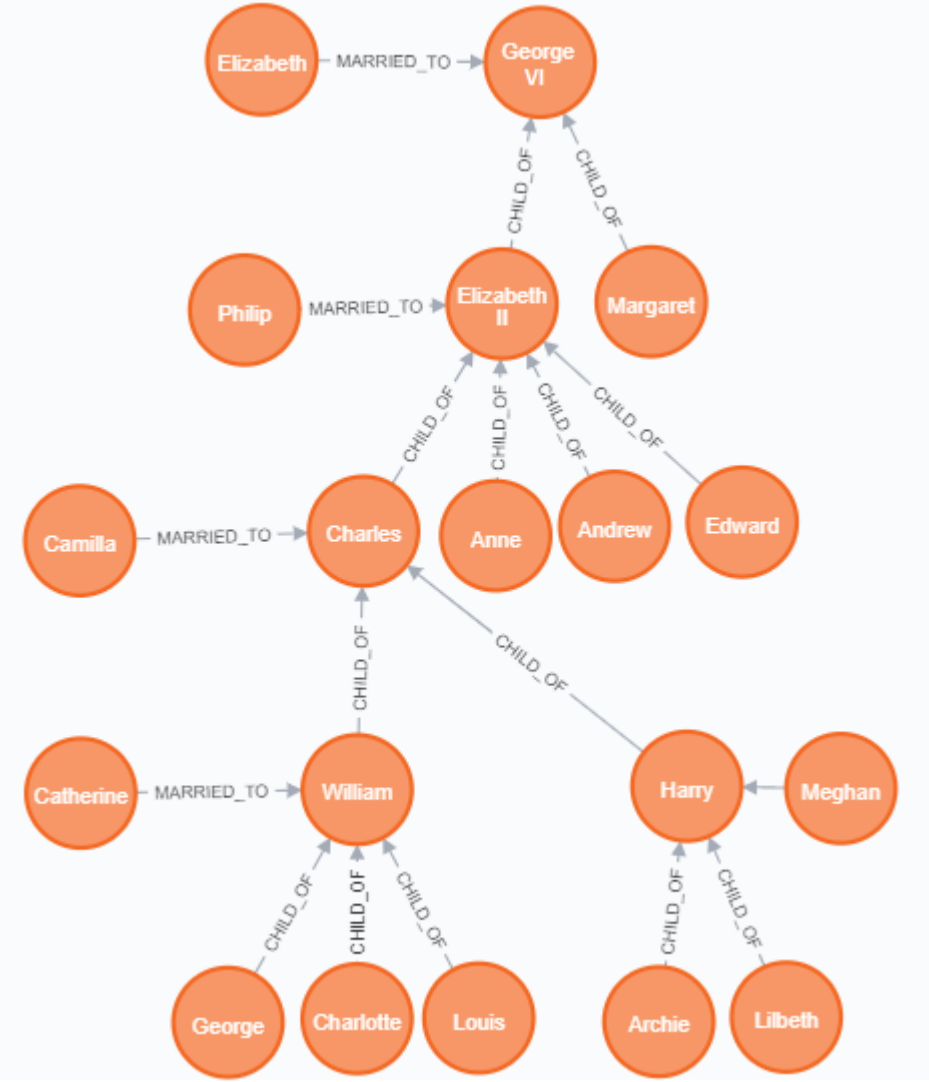
"Name"	"Courses"
"Tom"	1
"John"	2
"Anne"	1
"Mary"	1



Variable Length Pattern Matching

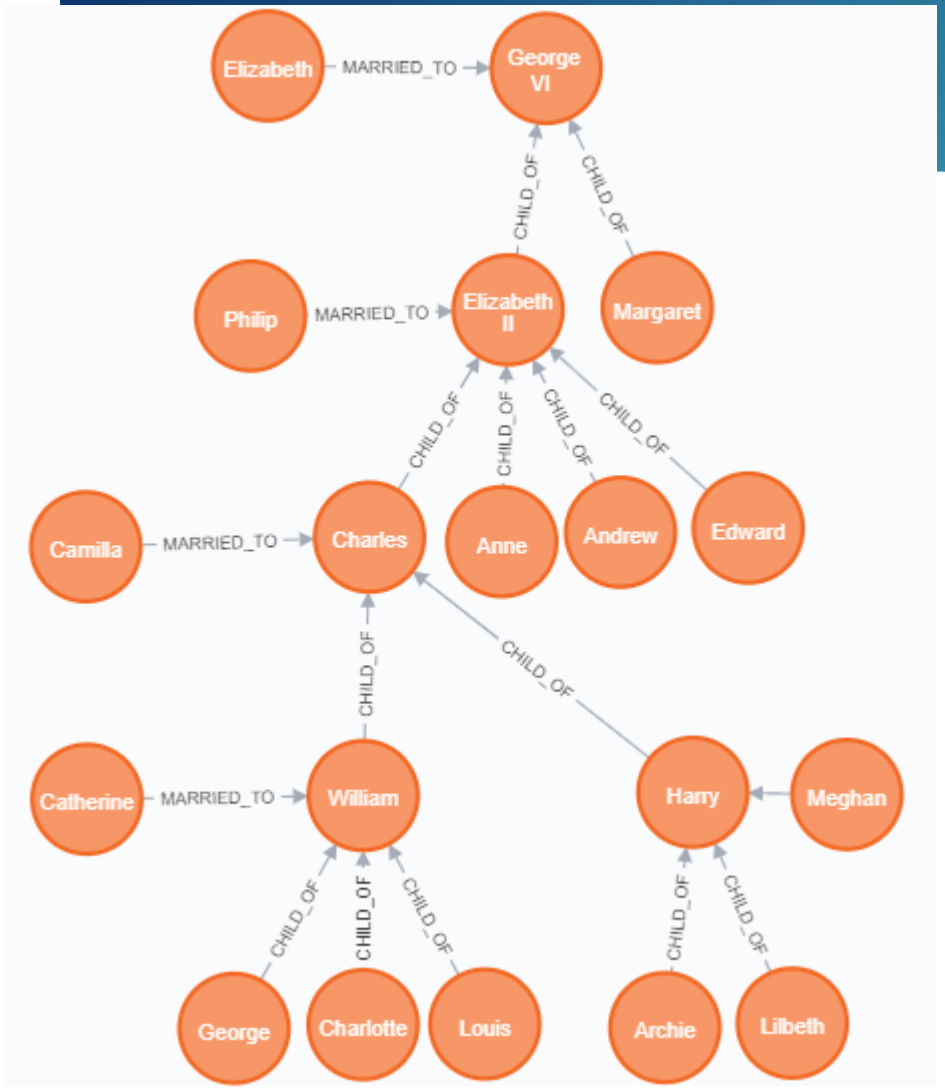
- Rather than describing a long path using a sequence of many node and relationship descriptions in a pattern, many relationships (and the intermediate nodes) can be described by specifying a length in the relationship description of a pattern.


Elizabeth
MARRIED_TO
George VI
CHILD_OF
CHILD_OF
Philip
MARRIED_TO
Elizabeth II
Margaret
CHILD_OF
CHILD_OF
CHILD_OF
CHILD_OF
Camilla
MARRIED_TO
Charles
Anne
Andrew
Edward
CHILD_OF
CHILD_OF
Catherine
MARRIED_TO
William
Harry
Meghan
CHILD_OF
CHILD_OF
CHILD_OF
CHILD_OF
CHILD_OF
George
Charlotte
Louis
Archie
Lilbeth



Show "George"s grandparent.

```
MATCH(g{name:"George"})
      -[:CHILD_OF]->
      ()
      -[:CHILD_OF]->
      (gp)
RETURN gp.name
```

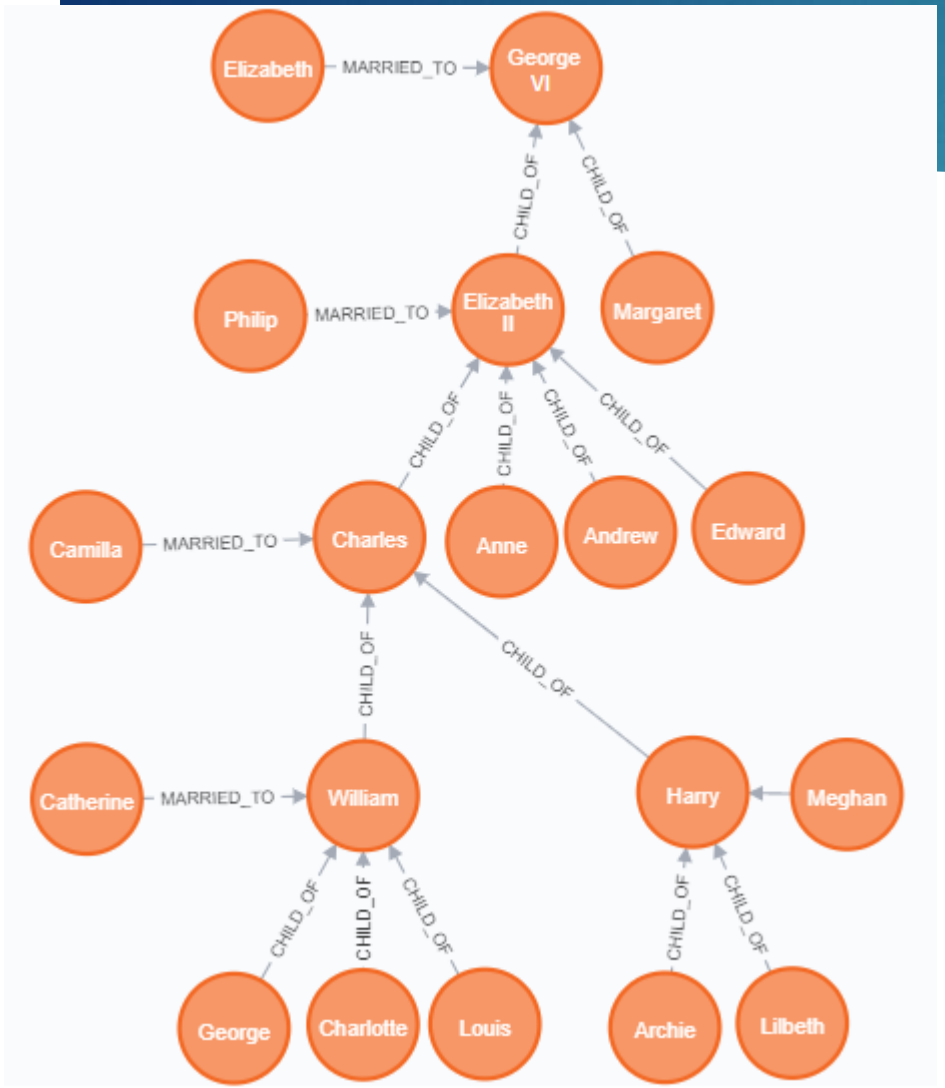


Show "George"s grandparent.

```
MATCH(g{name:"George"})
      -[:CHILD_OF]->
      ()
      -[:CHILD_OF]->
      (gp)
RETURN gp.name
```

Show "George"s great-grandparent.

```
MATCH(g{name:"George"})
      -[:CHILD_OF]->
      ()
      -[:CHILD_OF]->
      ()
      -[:CHILD_OF]->
      (ggp)
RETURN ggp.name
```



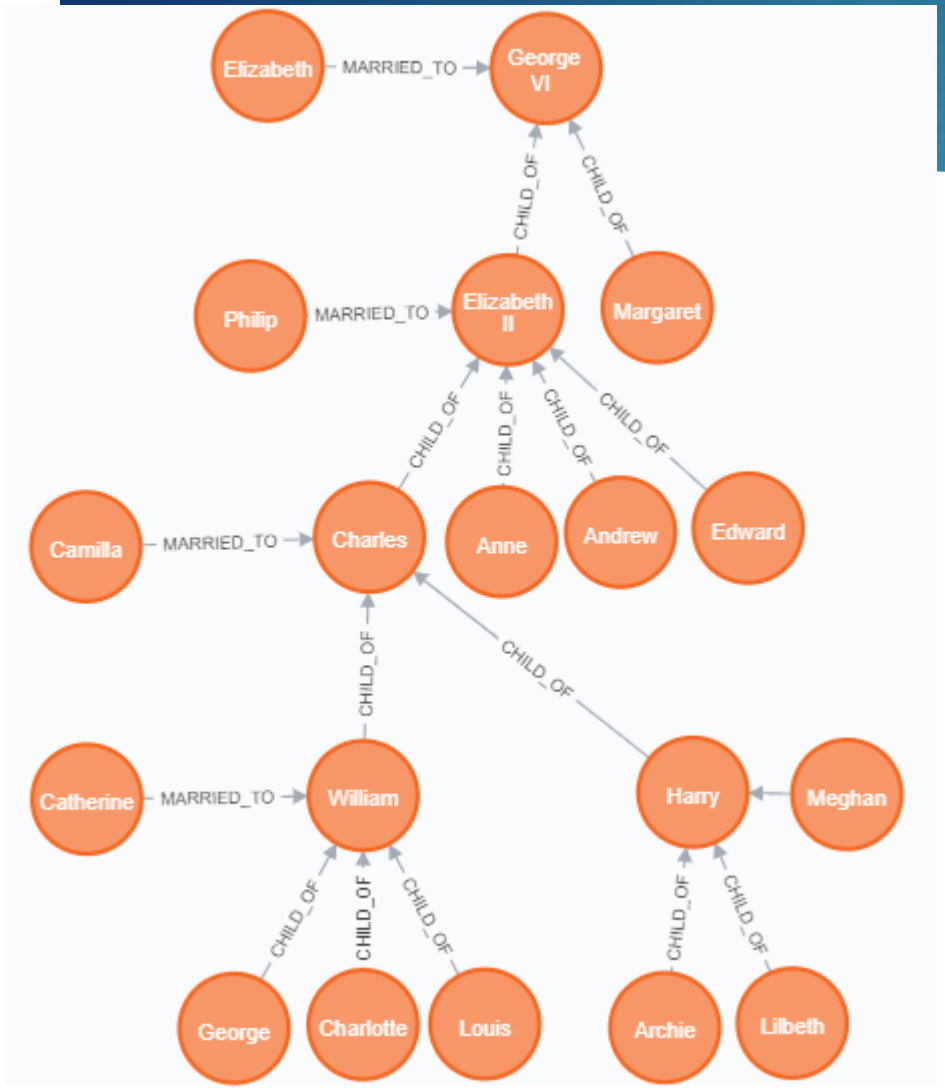
Show "George"s grandparent.

```
MATCH(g{name:"George"})
      -[:CHILD_OF]->
      ()
      -[:CHILD_OF]->
      (gp)
RETURN gp.name
```

```
MATCH(g{name:"George"})
      -[:CHILD_OF*2]->
      (gp)
RETURN gp.name
```

Show "George"s great-grandparent.

```
MATCH(g{name:"George"})
      -[:CHILD_OF]->
      ()
      -[:CHILD_OF]->
      ()
      -[:CHILD_OF]->
      (ggp)
RETURN ggp.name
```



Show "George"s grandparent.

```
MATCH(g{name:"George"})
      -[:CHILD_OF]->
      ()
      -[:CHILD_OF]->
      (gp)
RETURN gp.name
```

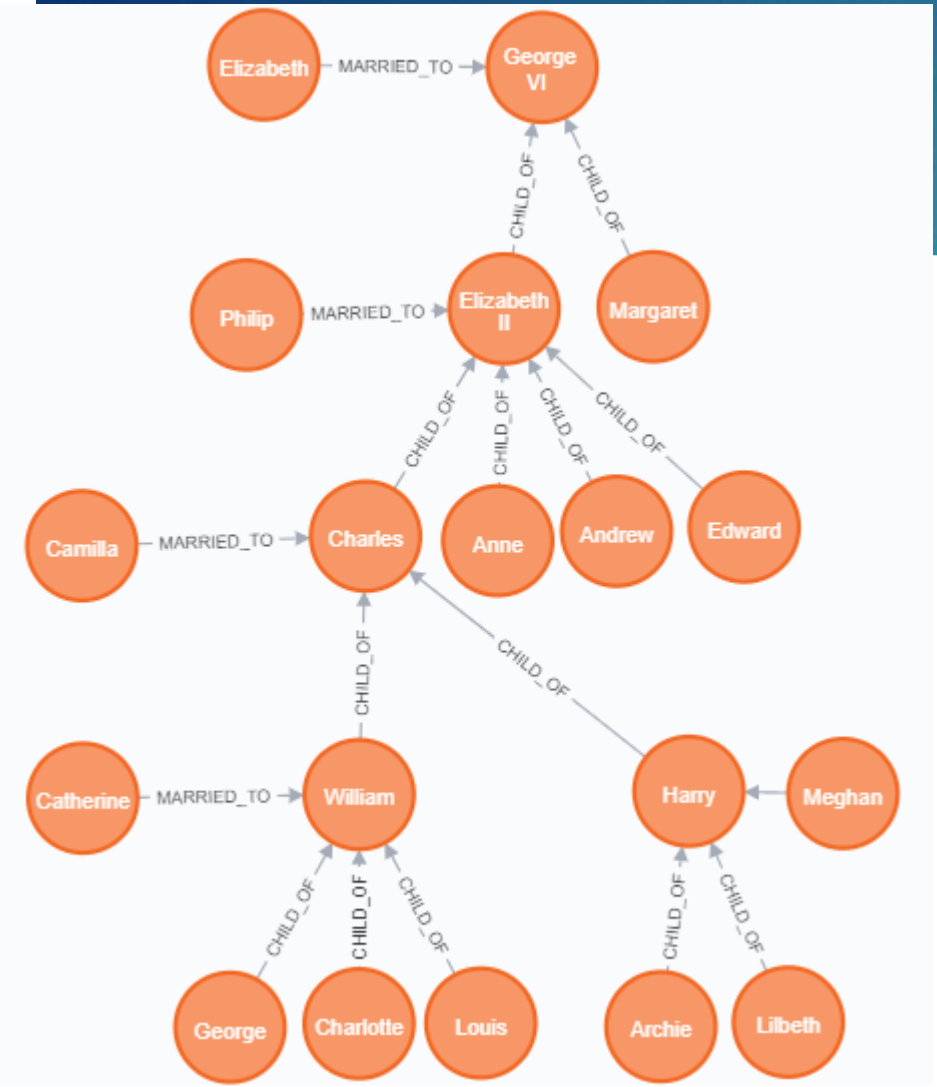
```
MATCH(g{name:"George"})
      -[:CHILD_OF*2]->
      (gp)
RETURN gp.name
```

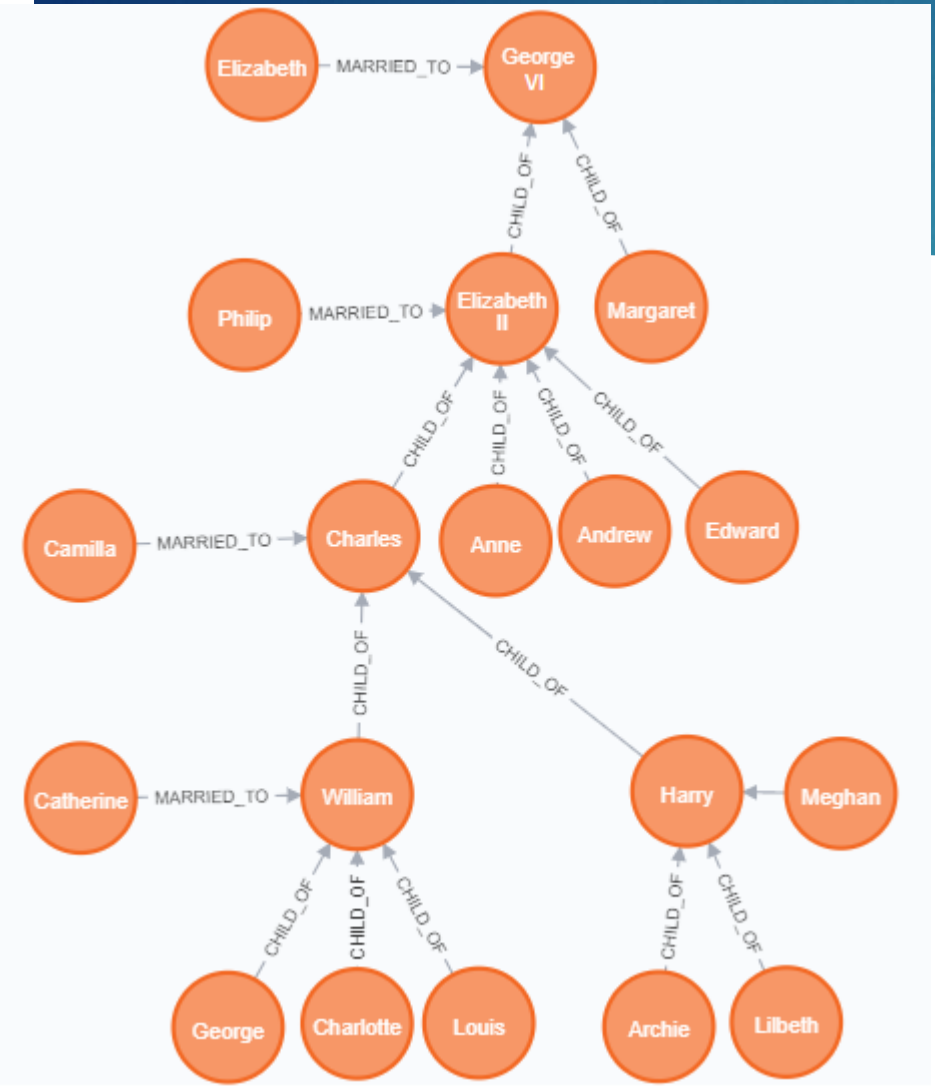
Show "George"s great-grandparent.

```
MATCH(g{name:"George"})
      -[:CHILD_OF]->
      ()
      -[:CHILD_OF]->
      ()
      -[:CHILD_OF]->
      (ggp)
RETURN ggp.name
```

```
MATCH(g{name:"George"})
      -[:CHILD_OF*3]->
      (gp)
RETURN gp.name
```

Show “George VI”s grandchildren and great-grandchildren.

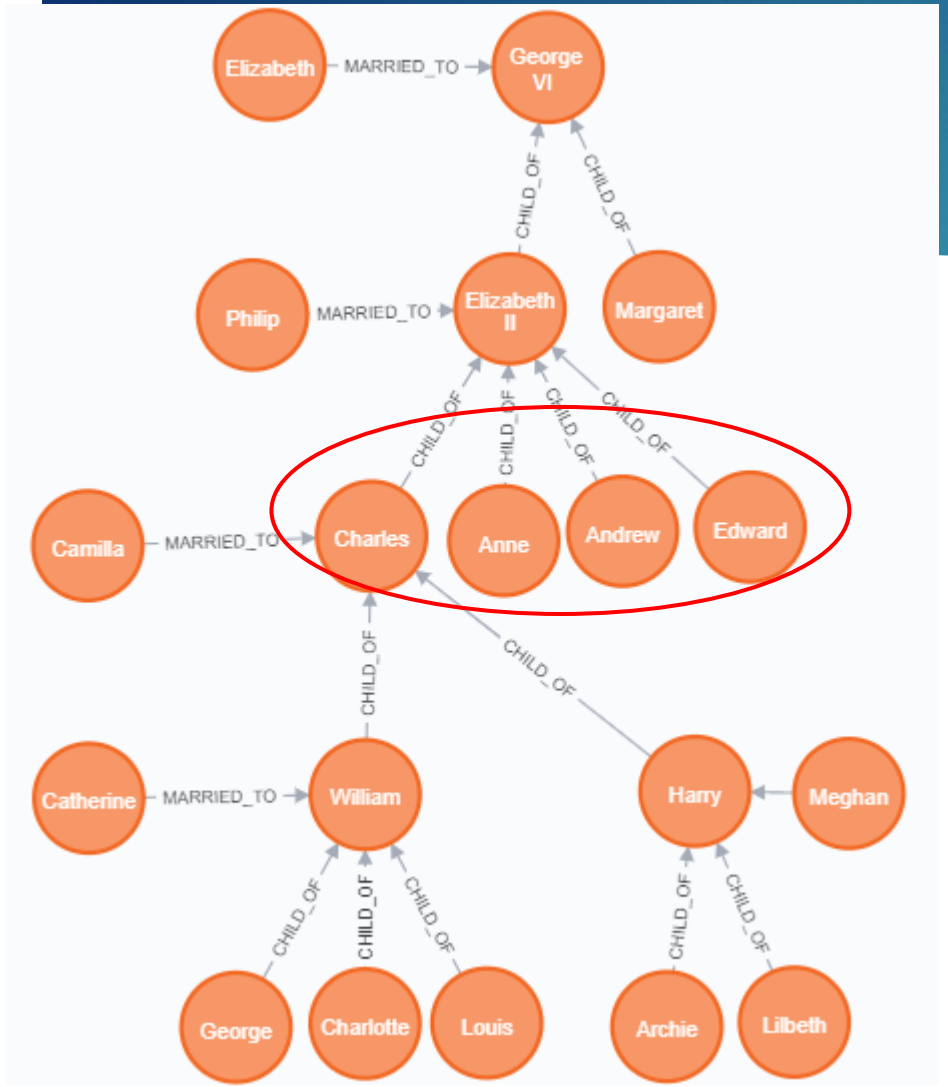




Show "George VI"s grandchildren and great-grandchildren.

```
MATCH(g{name:"George VI"})
      <-[:CHILD_OF*2..3]-
      (gc)
RETURN gc.name
```

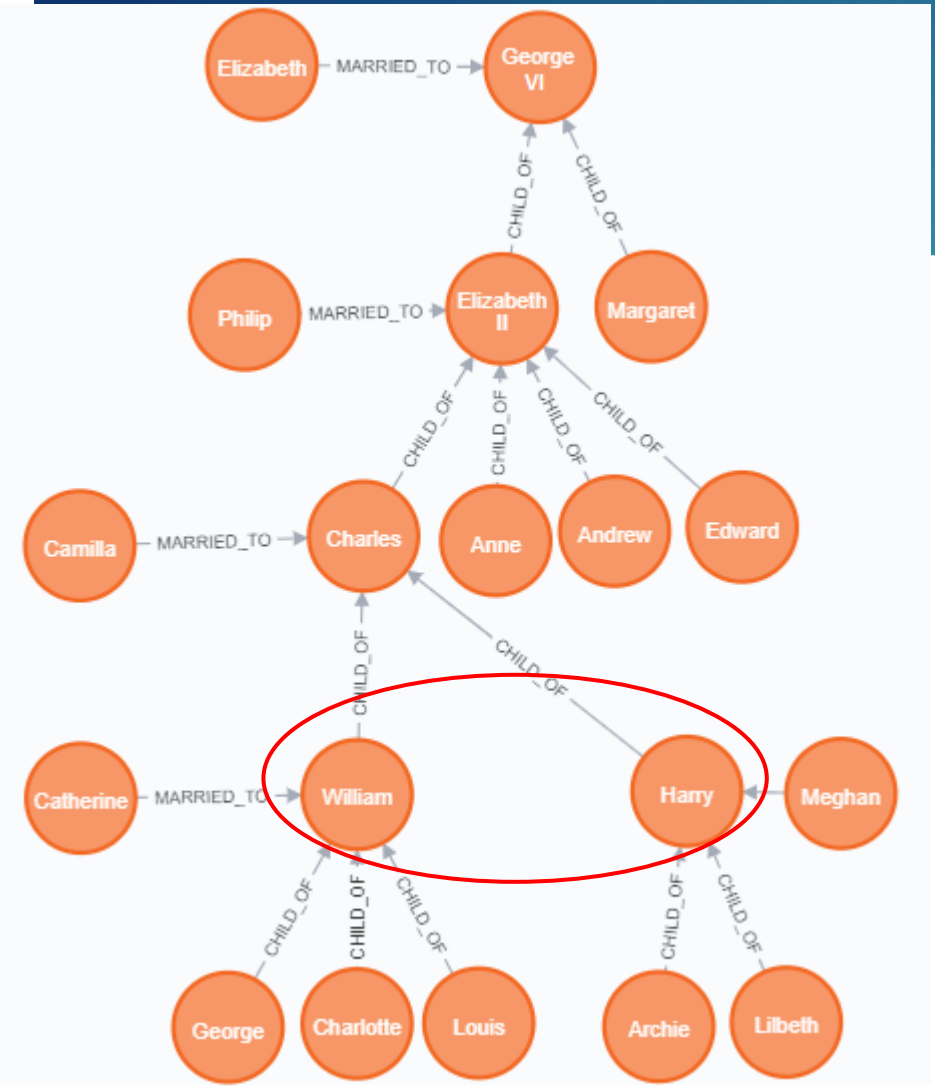
*min.. max



Show "George VI"s grandchildren and great-grandchildren.

```
MATCH(g{name:"George VI"})
      <-[:CHILD_OF*2..3]-
      (gc)
RETURN gc.name
```

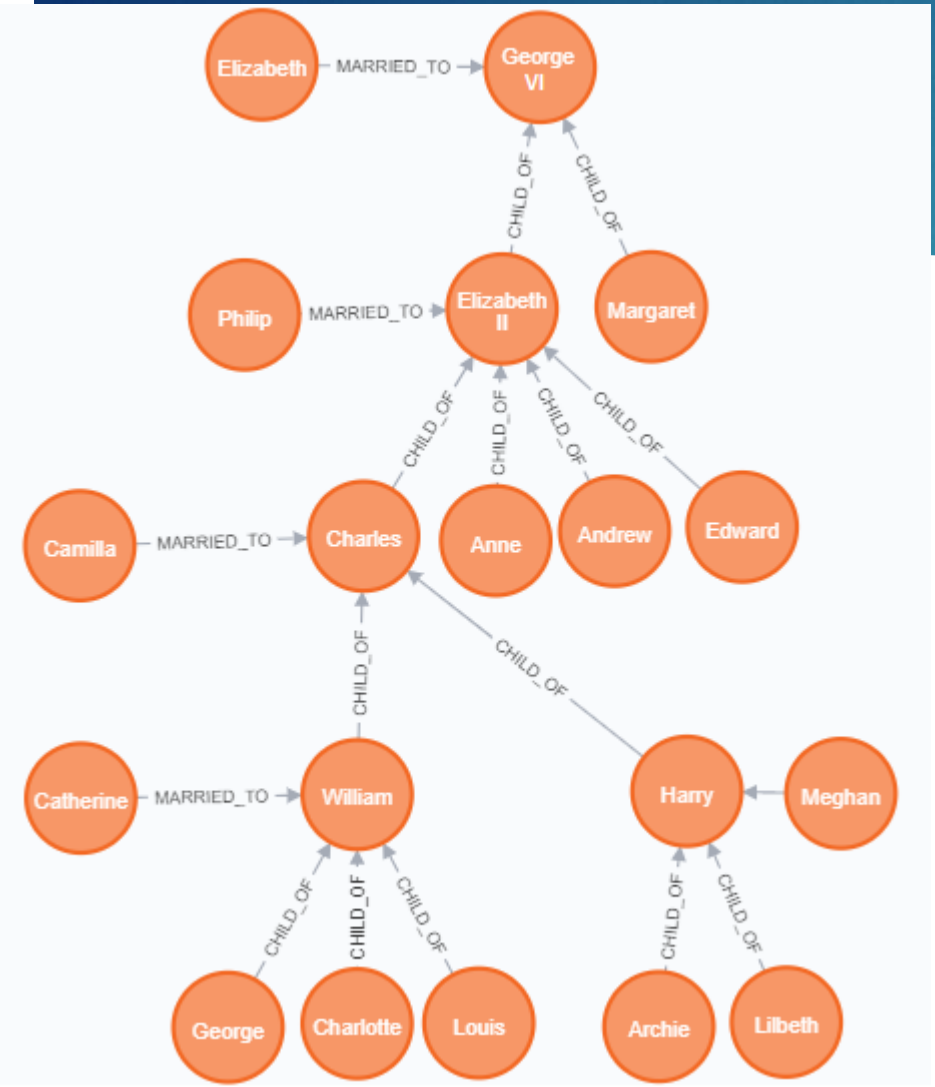
*min.. max



Show "George VI"s grandchildren and great-grandchildren.

```
MATCH(g{name:"George VI"})
      <-[:CHILD_OF*2..3]-
      (gc)
RETURN gc.name
```

*min.. max



Show "George VI"s grandchildren and great-grandchildren.

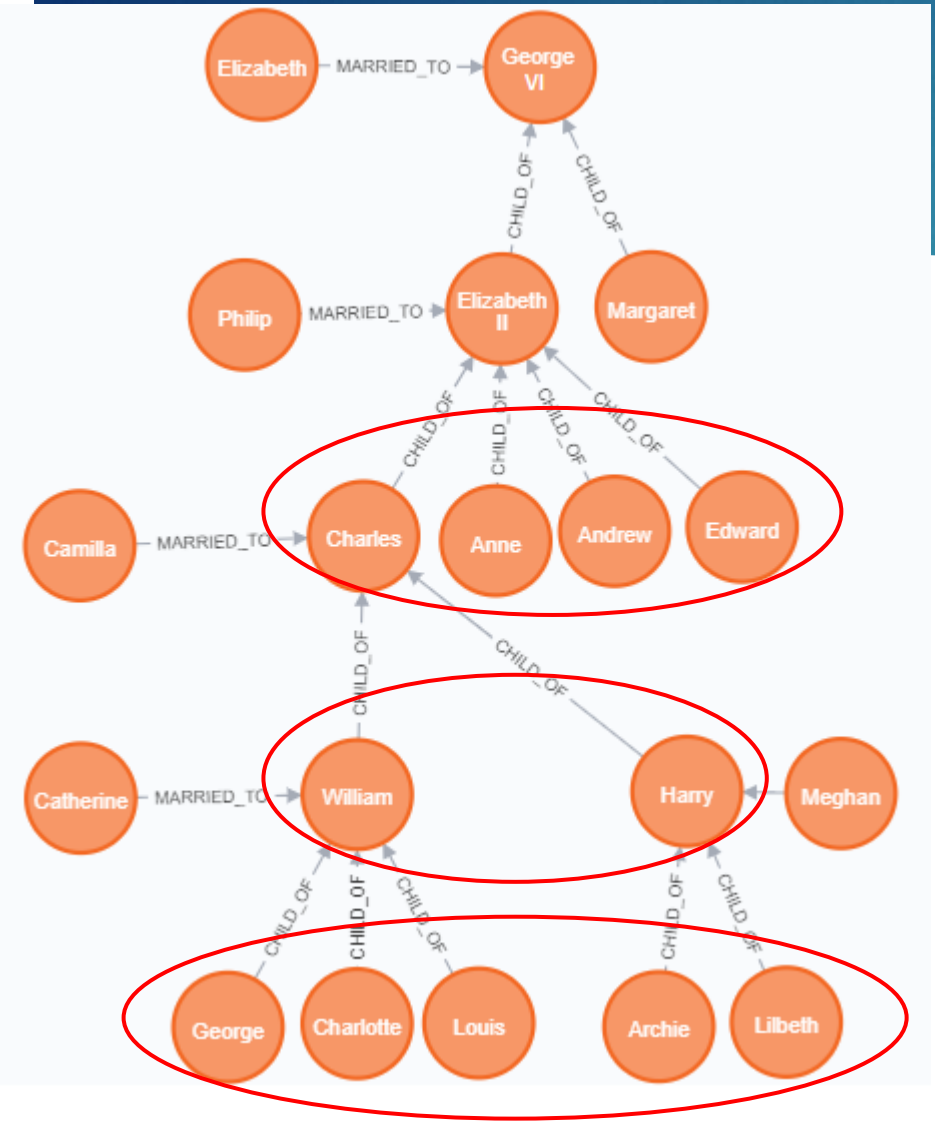
```
MATCH(g{name:"George VI"})
      <-[:CHILD_OF*2..3]-
      (gc)
RETURN gc.name
```

*min.. max

Show all "George VI"s descendants except his children.

```
MATCH(g{name:"George VI"})
      <-[:CHILD_OF*2..]-
      (gc)
RETURN gc.name
```

*min.. (no max)



Show "George VI"s grandchildren and great-grandchildren.

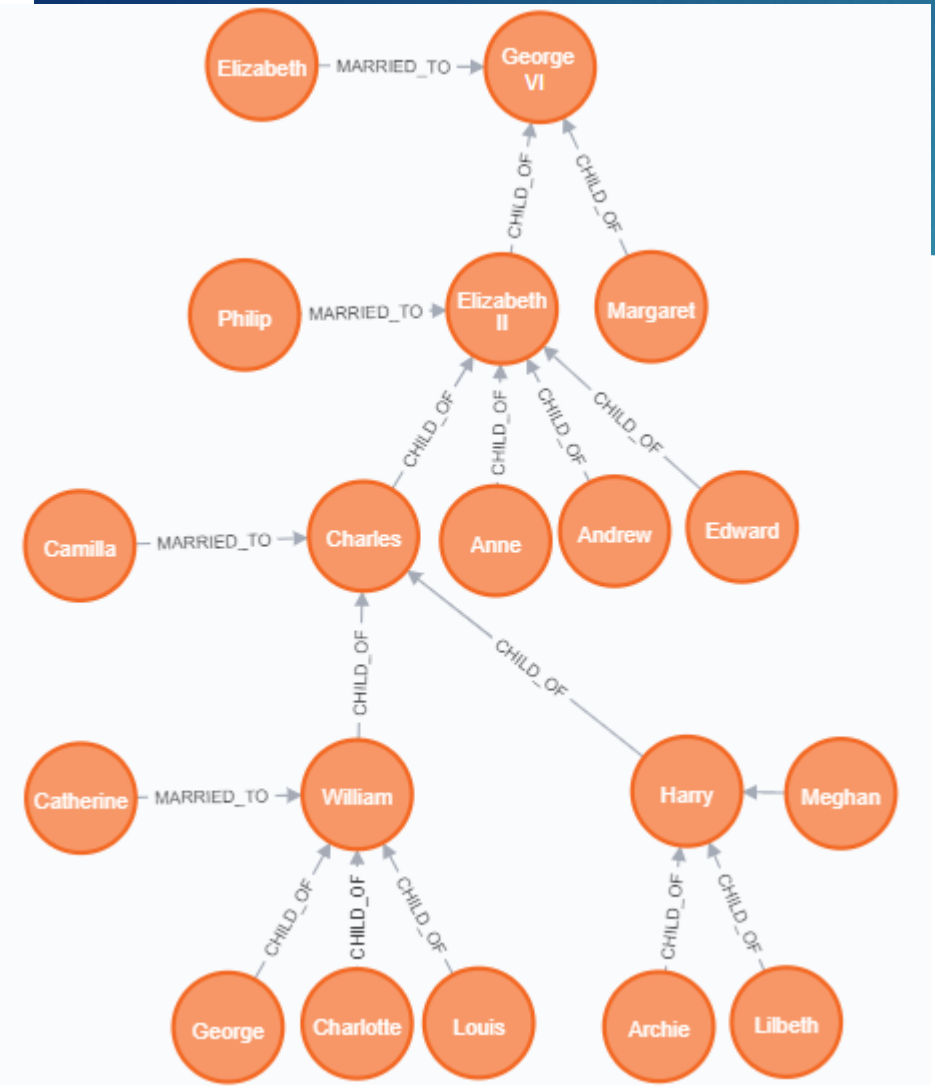
```
MATCH(g{name:"George VI"})
      <-[:CHILD_OF*2..3]-
      (gc)
RETURN gc.name
```

*min.. max

Show all "George VI"s descendants except his children.

```
MATCH(g{name:"George VI"})
      <-[:CHILD_OF*2..]-
      (gc)
RETURN gc.name
```

*min.. (no max)



Show "George VI"s grandchildren and great-grandchildren.

```
MATCH(g{name:"George VI"})
      <-[:CHILD_OF*2..3]-
      (gc)
RETURN gc.name
```

*min.. max

Show all "George VI"s descendants except his children.

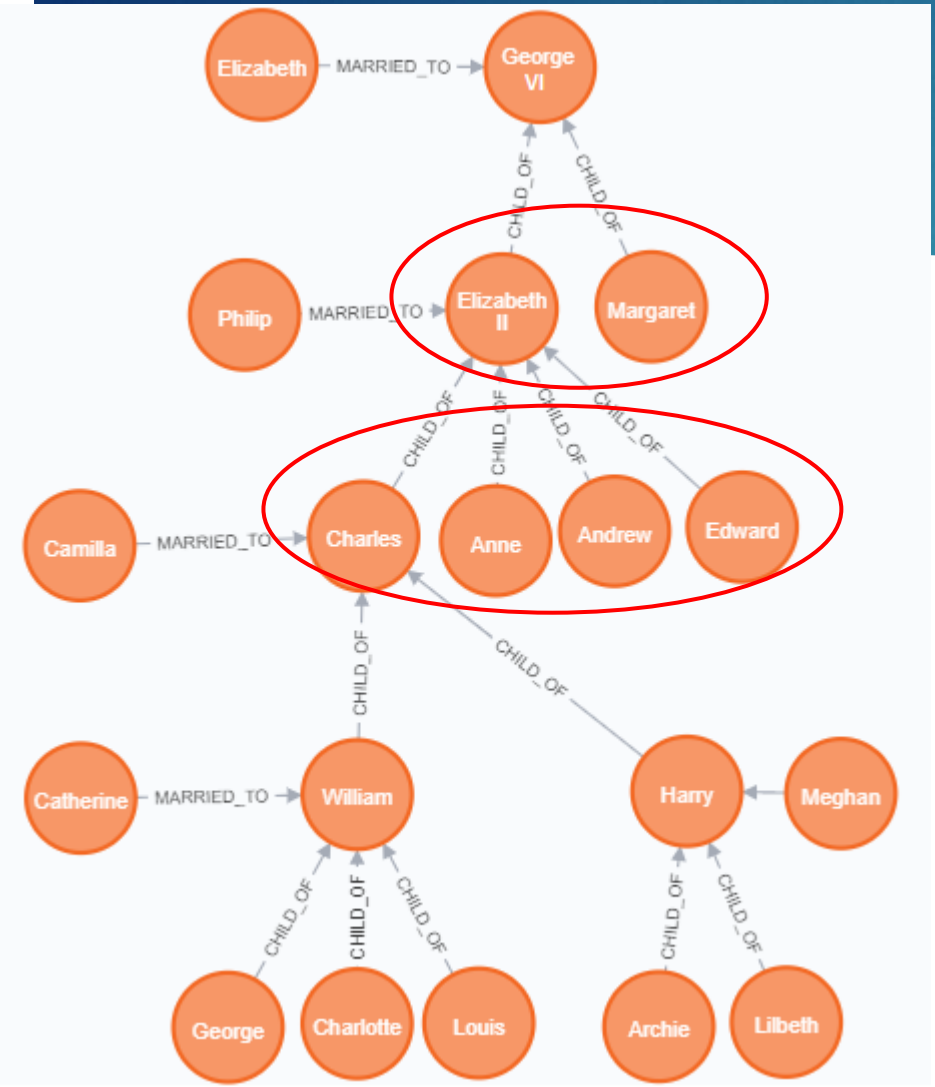
```
MATCH(g{name:"George VI"})
      <-[:CHILD_OF*2..]-
      (gc)
RETURN gc.name
```

*min.. (no max)

Show all "George VI"s children and grandchildren.

```
MATCH(g{name:"George VI"})
      <-[:CHILD_OF*..2]-
      (gc)
RETURN gc.name
```

*(no min).. max



Show "George VI"s grandchildren and great-grandchildren.

```
MATCH(g{name:"George VI"})
      <-[:CHILD_OF*2..3]-
      (gc)
RETURN gc.name
```

*min.. max

Show all "George VI"s descendants except his children.

```
MATCH(g{name:"George VI"})
      <-[:CHILD_OF*2..]-
      (gc)
RETURN gc.name
```

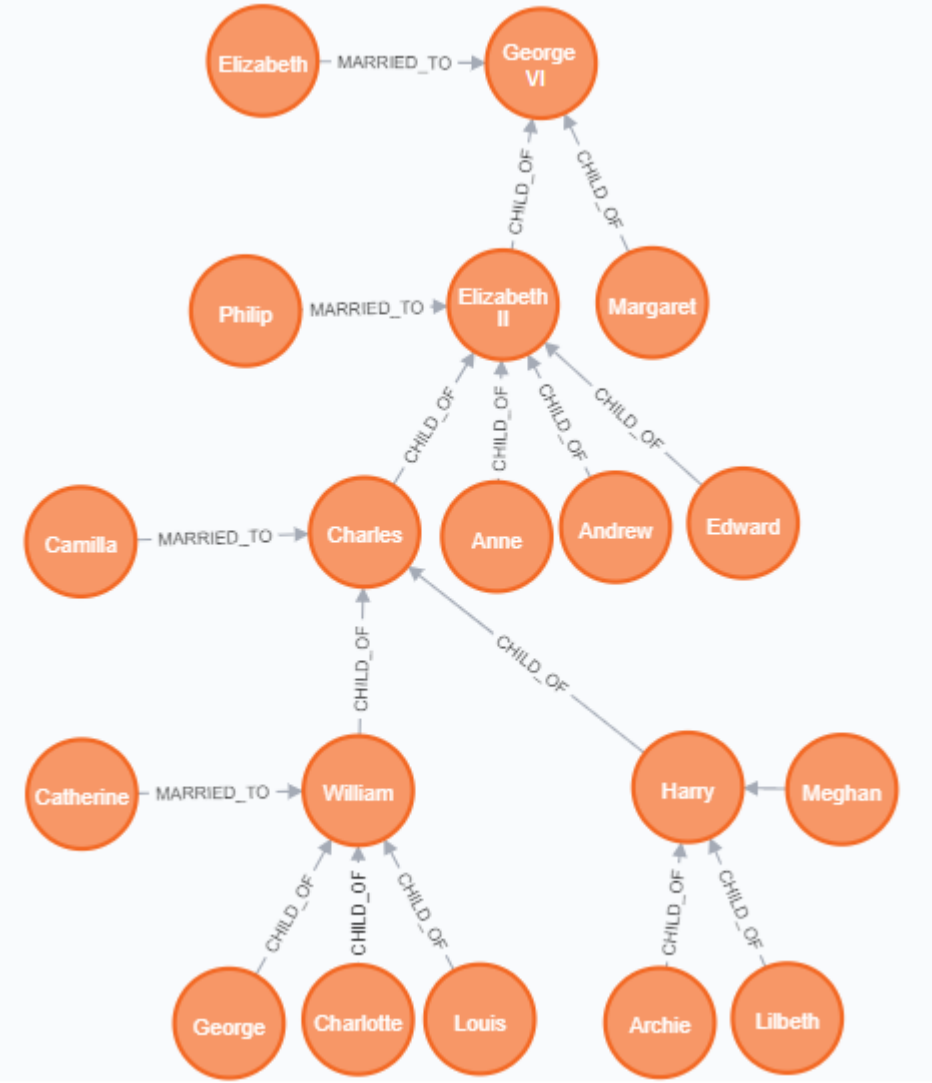
*min.. (no max)

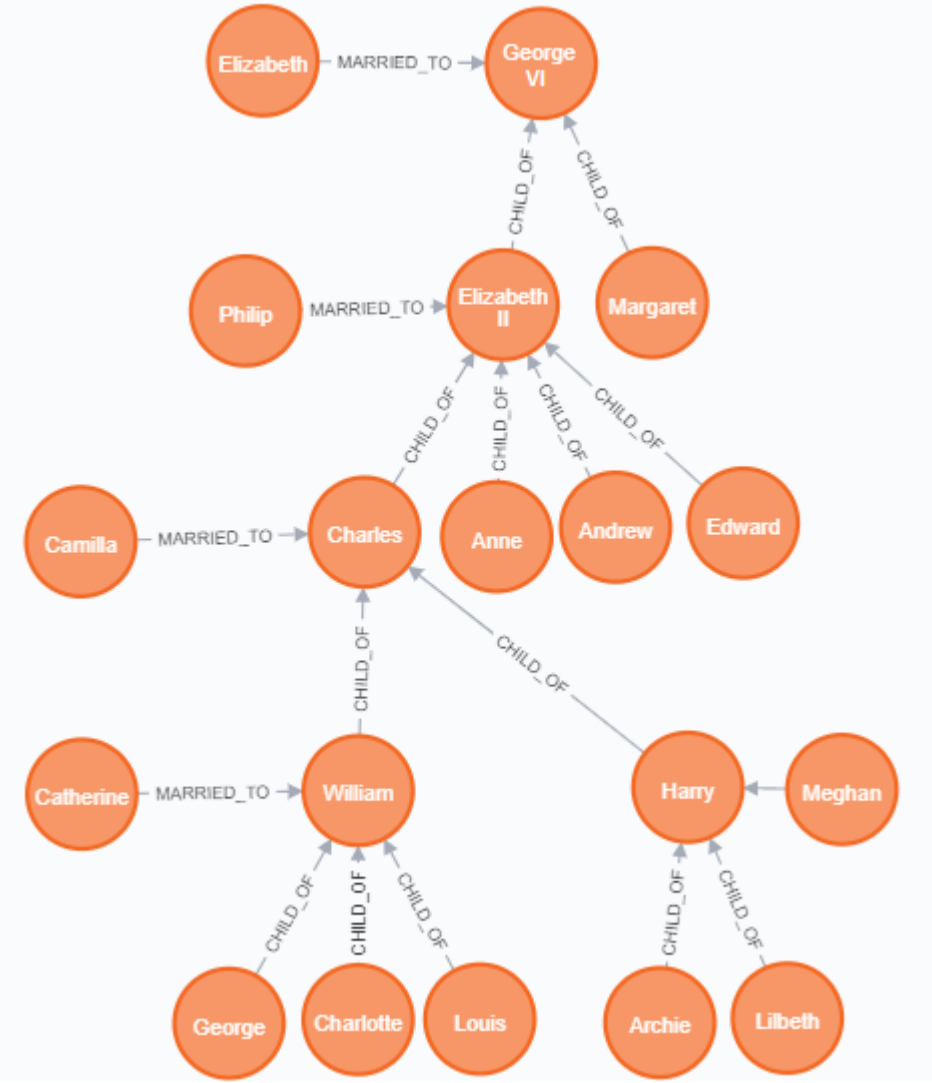
Show all "George VI"s children and grandchildren.

```
MATCH(g{name:"George VI"})
      <-[:CHILD_OF*..2]-
      (gc)
RETURN gc.name
```

*(no min).. max

Show all “George”s direct ancestors.

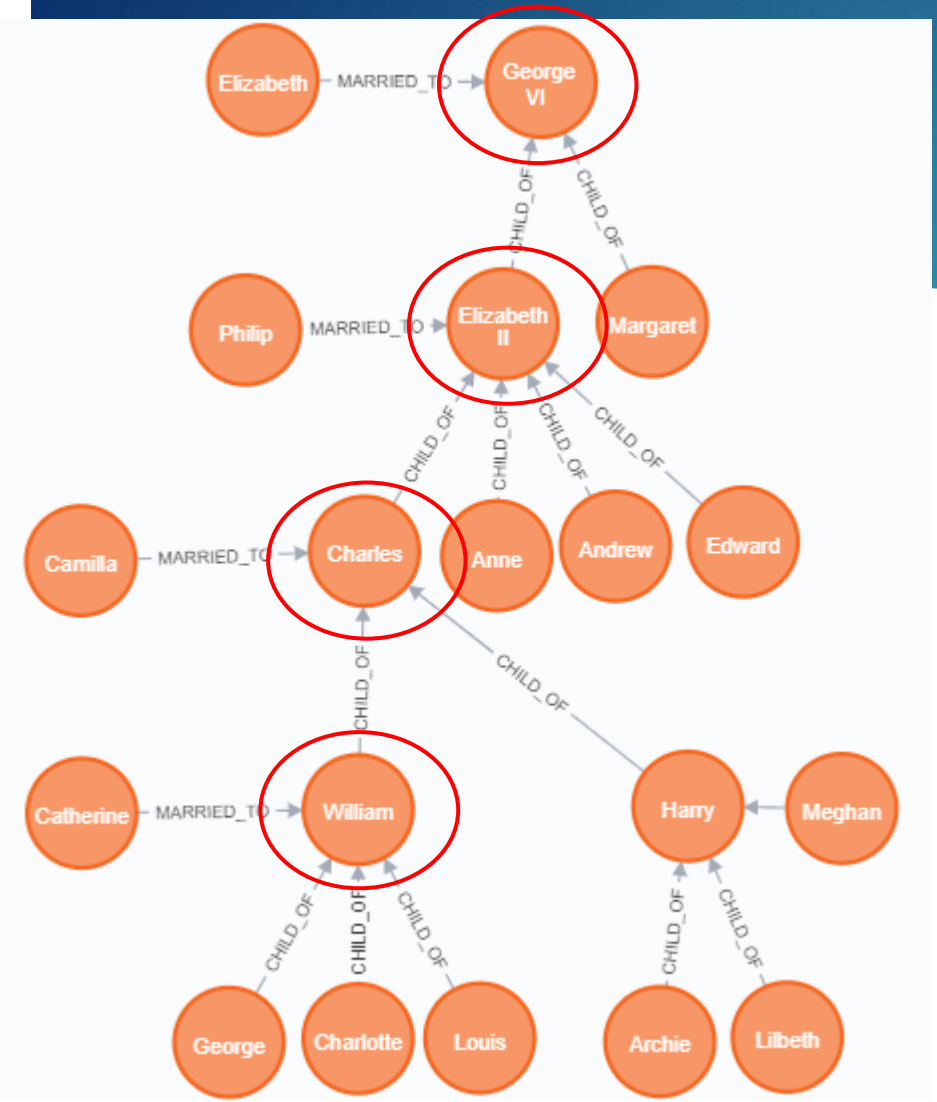




Show all "George"s direct ancestors.

```
MATCH(g{name:"George"})
      -[:CHILD_OF*]->
      (a)
RETURN a.name
```

(no min) (no max)



Show all "George"s direct ancestors.

```
MATCH(g{name:"George"})
      -[:CHILD_OF*]->
      (a)
RETURN a.name
```

(no min) (no max)

Variable Length Pattern Matching

`[*2]`	*exactly 2
`[*2..3]`	*min 2 max 3
`[*2..]`	*min 2 no max
`[*..2]`	*no min max 2
`[*]`	*no min no max