

61A Lecture 30

Announcements

Information Hiding

Attributes for Internal Use

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```
class FibIter:
    """An iterator over Fibonacci numbers."""
    def __init__(self):
        self._next = 0
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    def __next__(self):
        result = self._next
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        return result
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>>> [next(fibs) for _ in range(10)]
[0, 1, 1, 2, 3, 5, 8, 13, 21, 34]
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Starting a name with *two underscores* enforces restricted access from outside the class

Names in Local Scope

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```
def fib_generator():
    """A generator function for Fibonacci numbers.

    >>> fibs = fib_generator()
    >>> [next(fibs) for _ in range(10)]
    [0, 1, 1, 2, 3, 5, 8, 13, 21, 34]
    """
    yield 0
    previous, current = 0, 1
    while True:
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```

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    """  
    yield 0  
    previous, current = 0, 1  
    while True:  
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        previous, current = current, previous + current
```

There is no way to access values bound to "previous" and "current" externally

Singleton Objects

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class empty_iterator:
    """An iterator over no values."""
    def __next__(self):
        raise StopIteration
empty_iterator = empty_iterator()
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Declarative Languages

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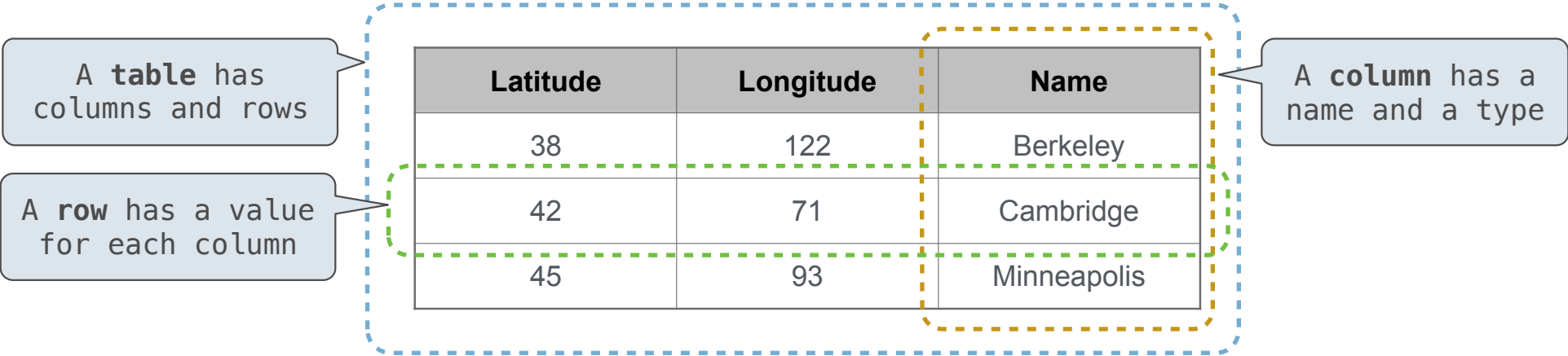
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A **column** has a name and a type

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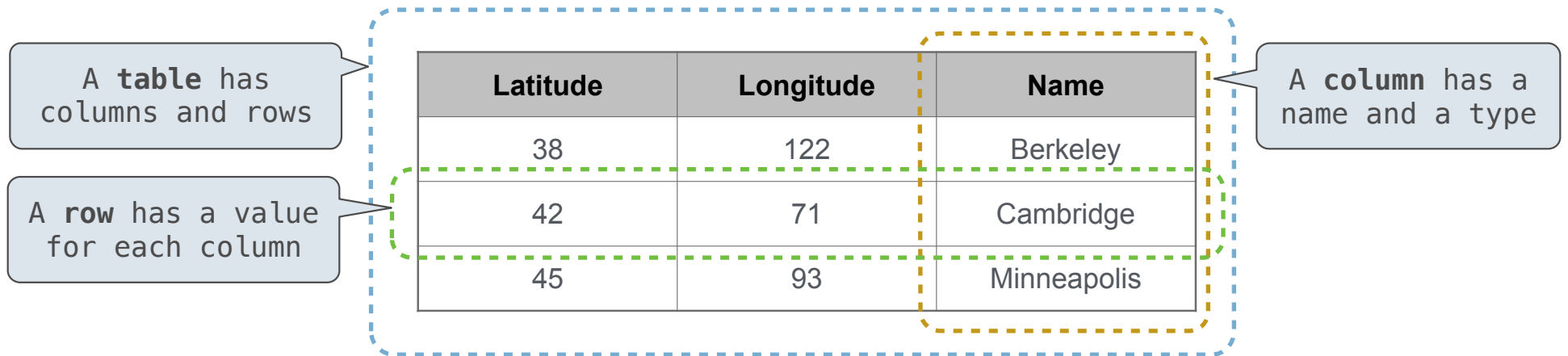
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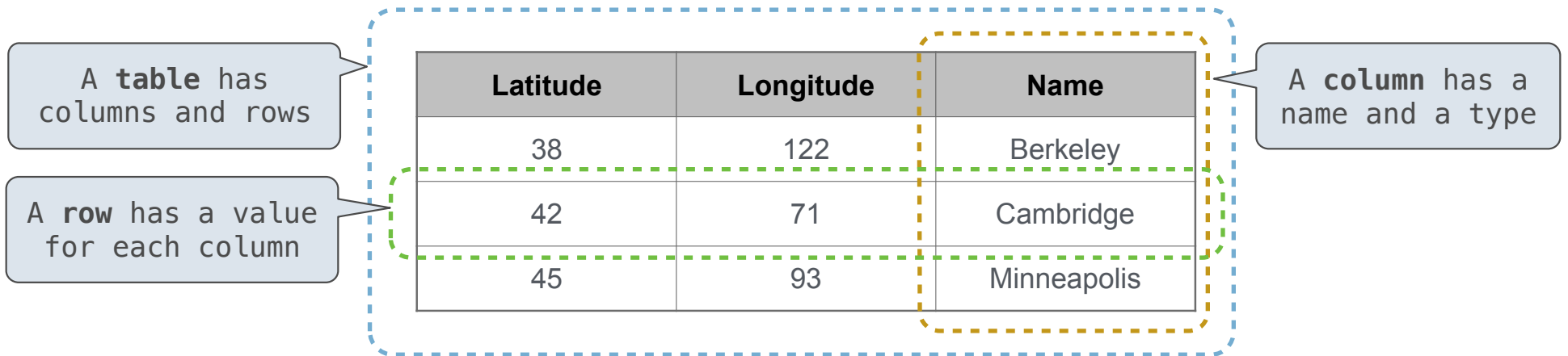


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SQL is a *declarative* programming language

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```
create table cities as
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```
  select 38 as latitude, 122 as longitude, "Berkeley" as name union
```

Cities:

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select 42,           71,           "Cambridge"           union
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```
select "west coast" as region, name from cities where longitude >= 115 union
select "other",      name from cities where longitude < 115;
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Region	Name
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Structured Query Language (SQL)

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- A **create table** statement gives a global name to a table
- Lots of other statements exist: **analyze**, **delete**, **explain**, **insert**, **replace**, **update**, etc.
- Most of the important action is in the **select** statement

Today's theme:



Getting Started with SQL

Install sqlite (version 3.8.3 or later): <http://sqlite.org/download.html>

Use sqlite online: <http://kripken.github.io/sql.js/GUI/>

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select "delano" as parent, "herbert" as child;
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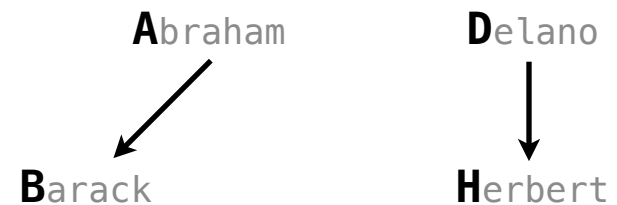
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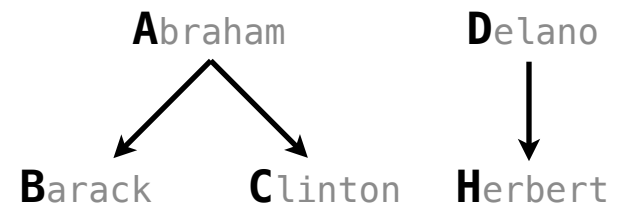
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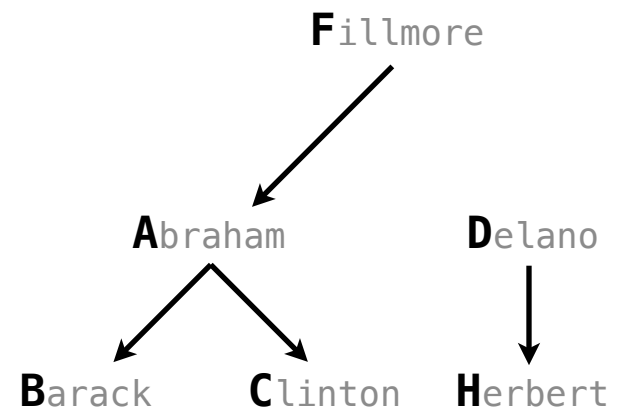
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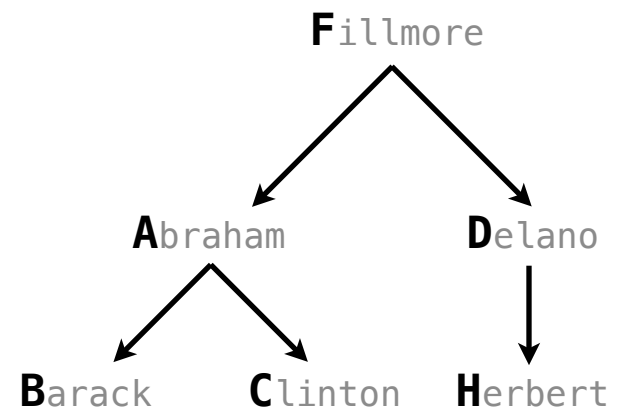
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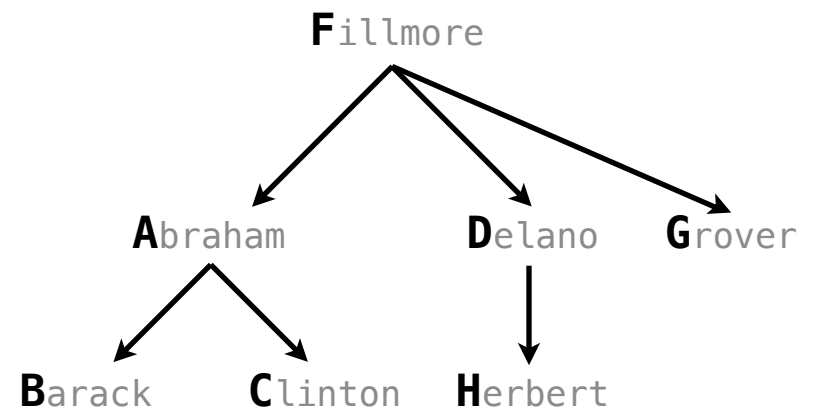
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select "fillmore"     , "abraham"   union
select "fillmore"     , "delano"   union
select "fillmore"     , "grover"   union
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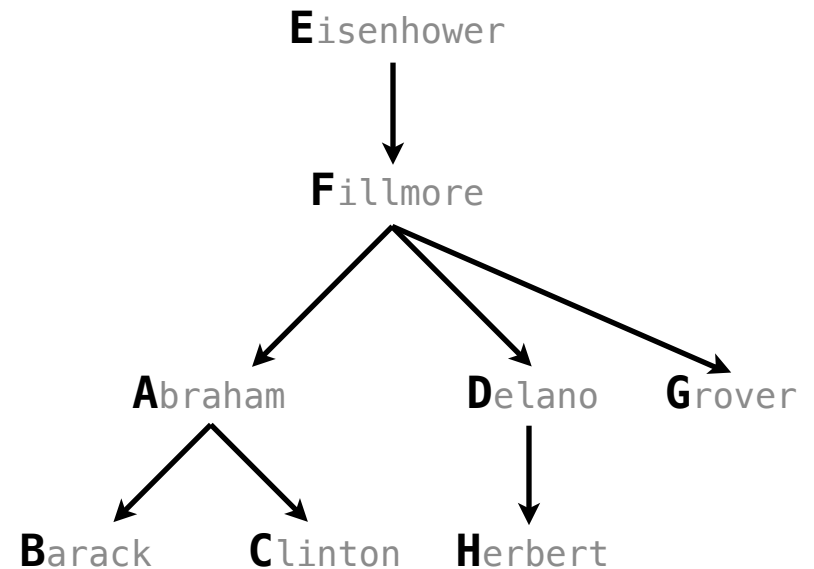
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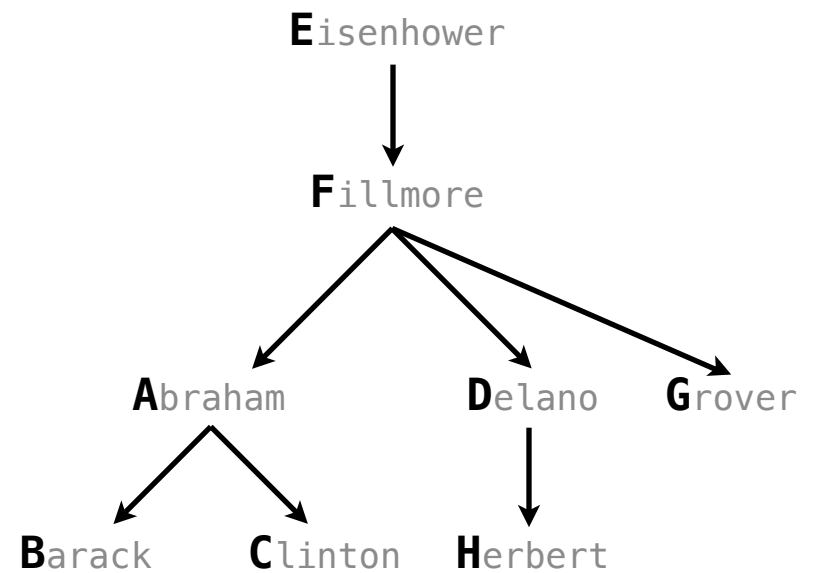
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select "fillmore"     , "grover"    union
select "eisenhower"  , "fillmore";
```



Naming Tables

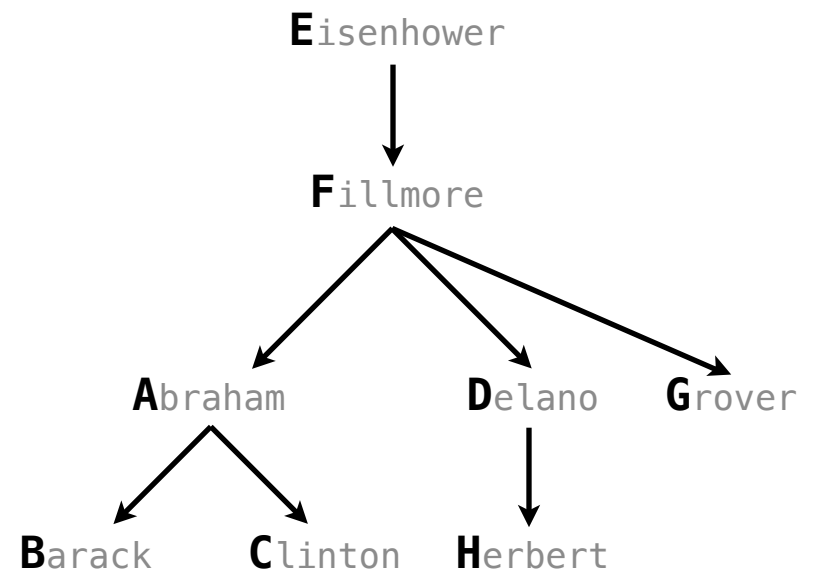
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Naming Tables

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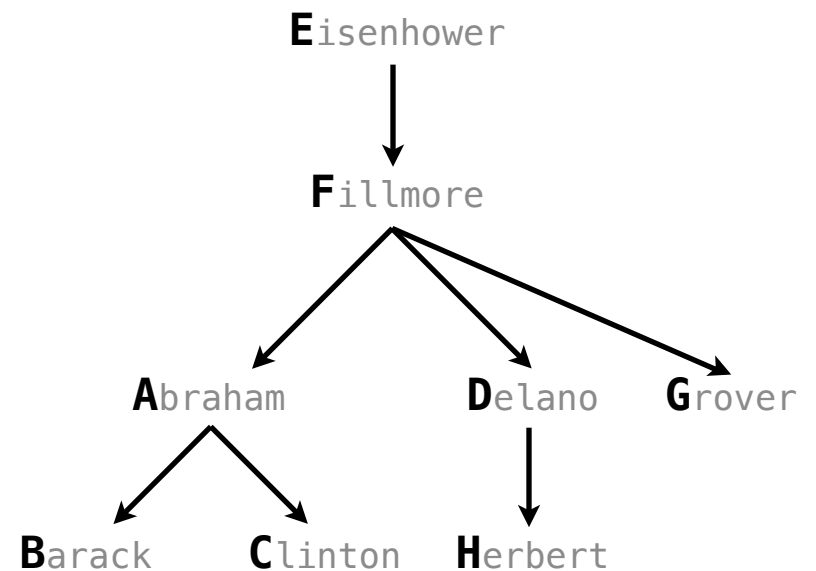


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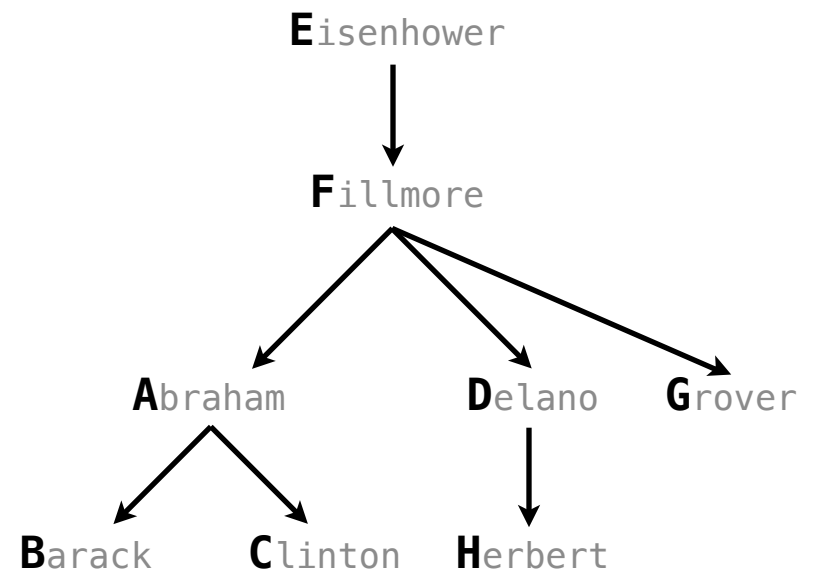
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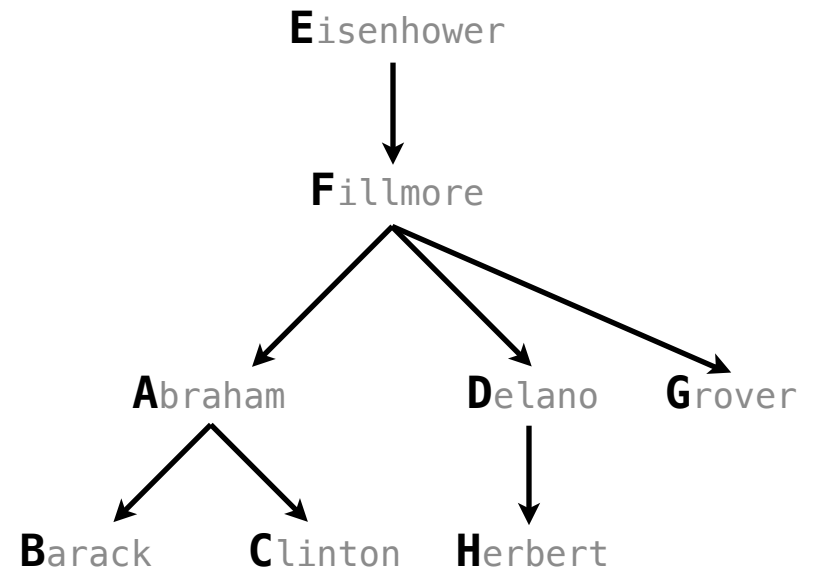
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A **create table** statement gives the result a name

```
create table [name] as [select statement];
```

```
select "delano" as parent, "herbert" as child
select "abraham"      , "barack"      union
select "abraham"      , "clinton"    union
select "fillmore"     , "abraham"   union
select "fillmore"     , "delano"    union
select "fillmore"     , "grover"    union
select "eisenhower"   , "fillmore";
```



Naming Tables

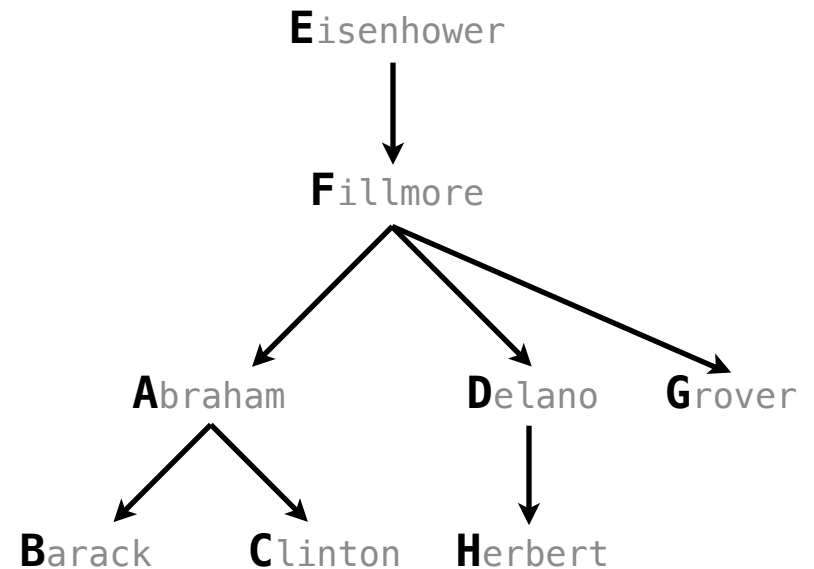
SQL is often used as an interactive language

The result of a **select** statement is displayed to the user, but not stored

A **create table** statement gives the result a name

```
create table [name] as [select statement];
```

```
create table parents as
select "delano" as parent, "herbert" as child
select "abraham"      , "barack"      union
select "abraham"      , "clinton"    union
select "fillmore"     , "abraham"  union
select "fillmore"     , "delano"   union
select "fillmore"     , "grover"   union
select "eisenhower"   , "fillmore";
```



Naming Tables

SQL is often used as an interactive language

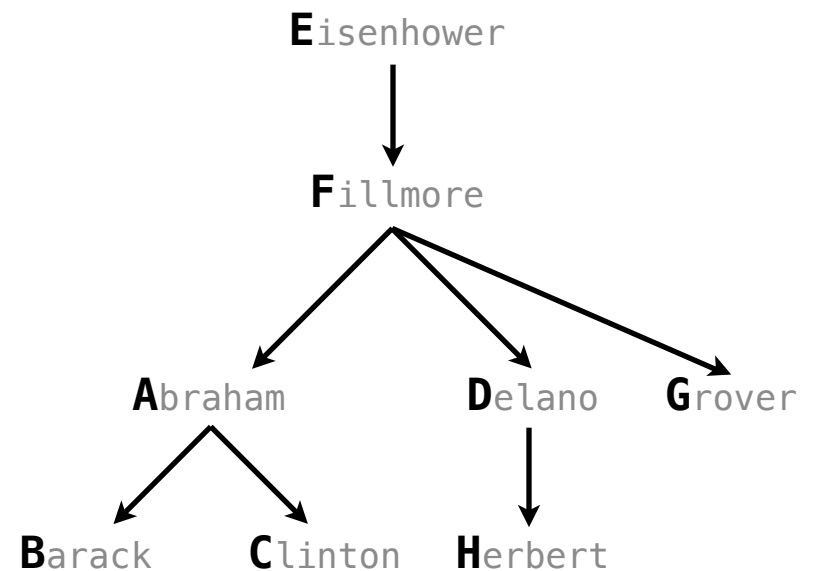
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```
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```

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Naming Tables

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select "fillmore"     , "delano"         union
select "fillmore"     , "grover"         union
select "eisenhower"   , "fillmore";
```

Parents:

Parent	Child
abraham	barack
abraham	clinton
delano	herbert
fillmore	abraham
fillmore	delano
fillmore	grover
eisenhower	fillmore

Projecting Tables

Select Statements Project Existing Tables

Select Statements Project Existing Tables

A **select** statement can specify an input table using a **from** clause

Select Statements Project Existing Tables

A **select** statement can specify an input table using a **from** clause

```
select [expression] as [name], [expression] as [name], ... ;
```

Select Statements Project Existing Tables

A **select** statement can specify an input table using a **from** clause

```
select [expression] as [name], [expression] as [name], ... ;  
select [columns] ;
```

Select Statements Project Existing Tables

A **select** statement can specify an input table using a **from** clause

```
select [expression] as [name], [expression] as [name], ... ;  
select [columns] from [table] ;
```

Select Statements Project Existing Tables

A **select** statement can specify an input table using a **from** clause

A subset of the rows of the input table can be selected using a **where** clause

```
select [expression] as [name], [expression] as [name], ... ;  
select [columns] from [table] ;
```

Select Statements Project Existing Tables

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A subset of the rows of the input table can be selected using a **where** clause

```
select [expression] as [name], [expression] as [name], ... ;  
select [columns] from [table] where [condition] ;
```

Select Statements Project Existing Tables

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A subset of the rows of the input table can be selected using a **where** clause

An ordering over the remaining rows can be declared using an **order by** clause

```
select [expression] as [name], [expression] as [name], ... ;  
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```
select [expression] as [name], [expression] as [name], ... ;
```

```
select [columns] from [table] where [condition] order by [order];
```


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Column descriptions determine how each input row is projected to a result row

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select [expression] as [name], [expression] as [name], ... ;
```

```
select [columns] from [table] where [condition] order by [order];
```

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A **select** statement can specify an input table using a **from** clause

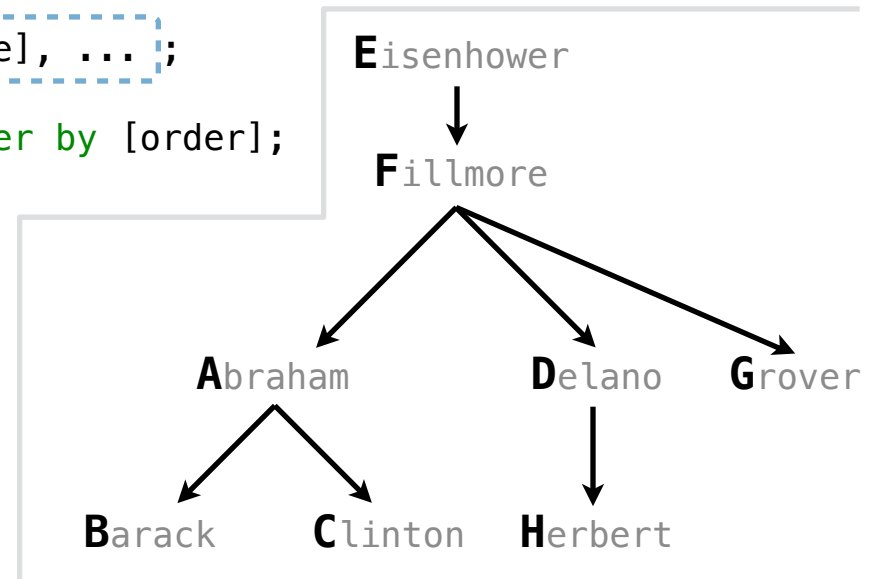
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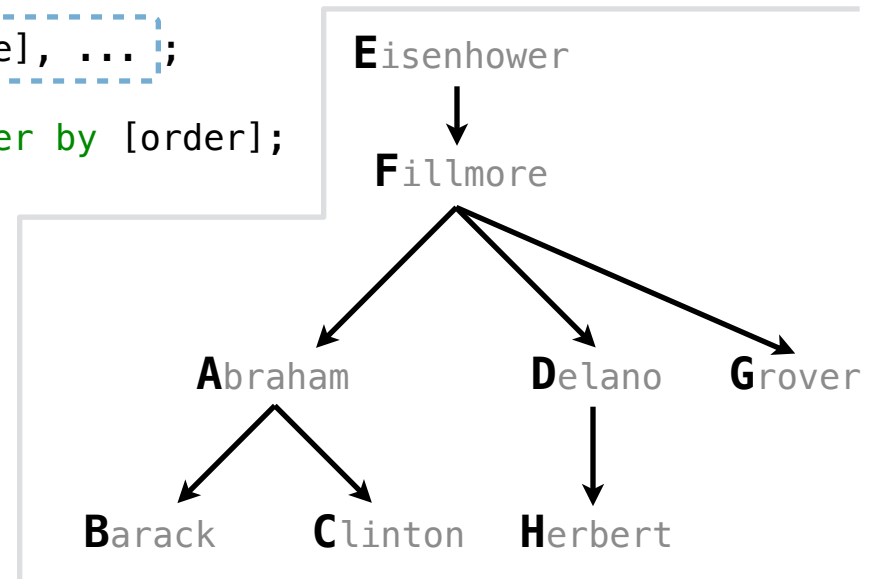
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```

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select [columns] from [table] where [condition] order by [order];
```

```
select child from parents where parent = "abraham";
```



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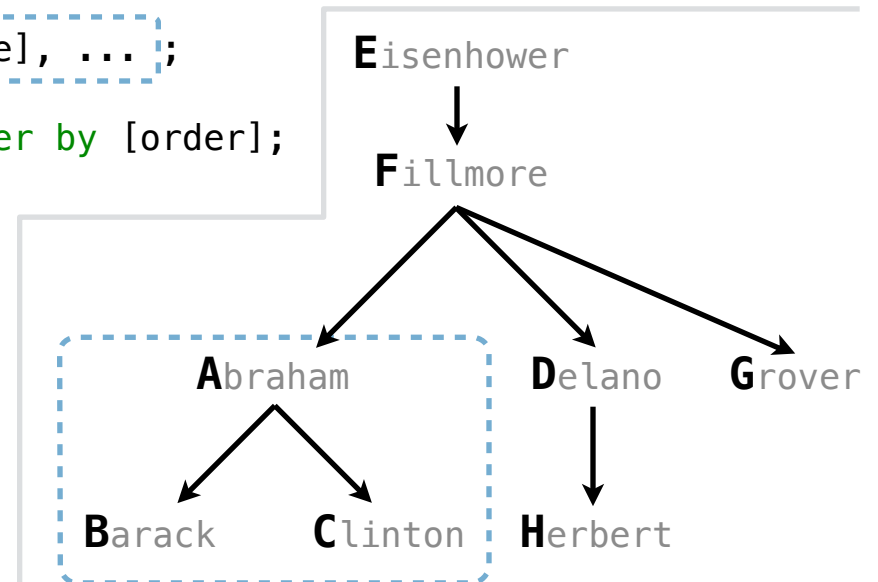
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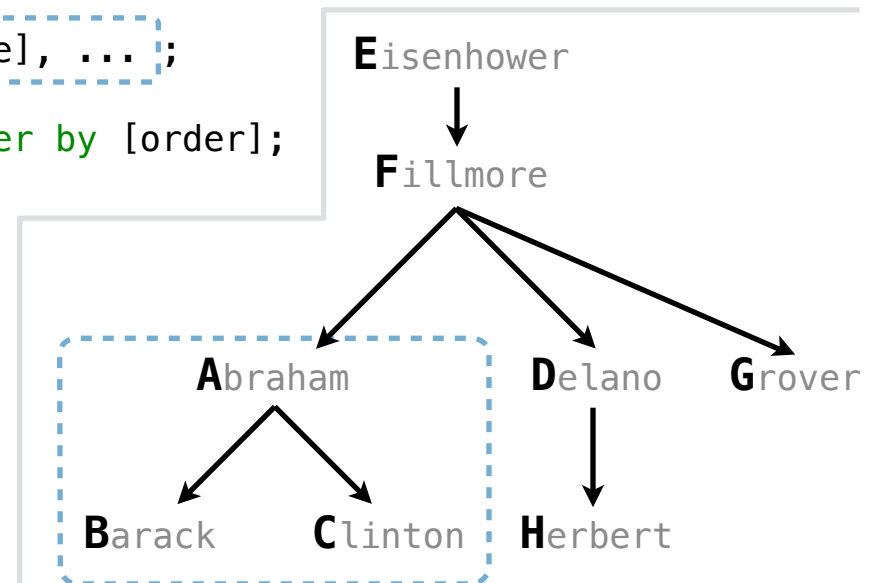
Column descriptions determine how each input row is projected to a result row

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select [expression] as [name], [expression] as [name], ... ;
```

```
select [columns] from [table] where [condition] order by [order];
```

```
select child from parents where parent = "abraham";
```

Child
barack
clinton



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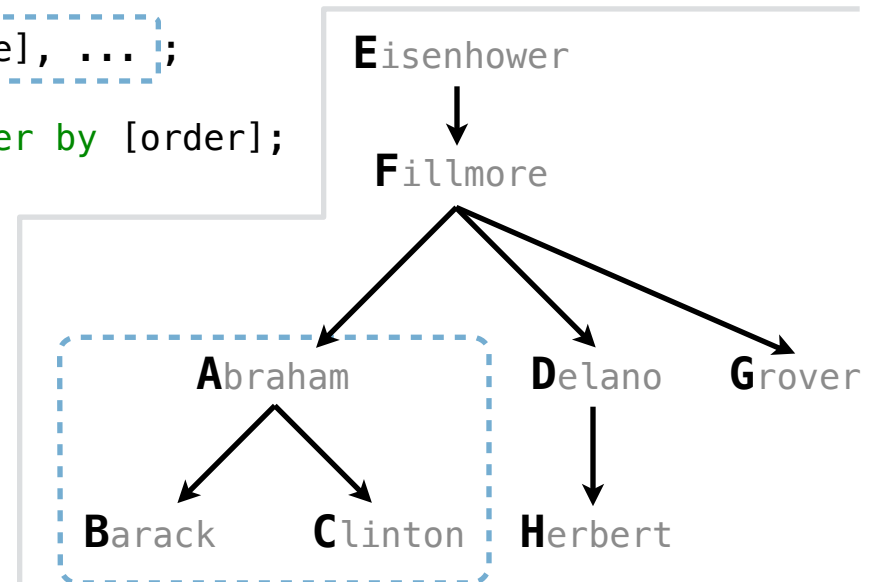
```
select [expression] as [name], [expression] as [name], ... ;
```

```
select [columns] from [table] where [condition] order by [order];
```

```
select child from parents where parent = "abraham";
```

```
select parent from parents where parent > child;
```

Child
barack
clinton



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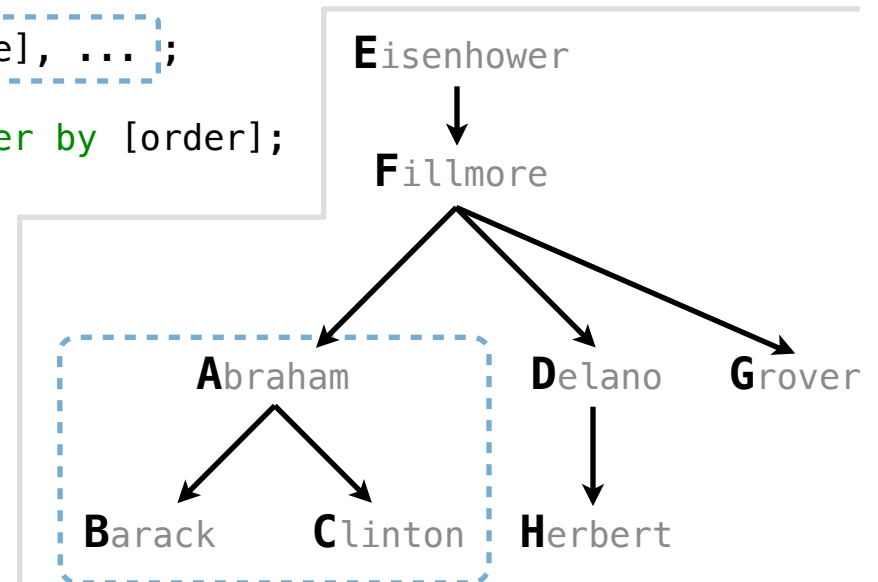
```
select [columns] from [table] where [condition] order by [order];
```

```
select child from parents where parent = "abraham";
```

```
select parent from parents where parent > child;
```

Child
barack
clinton

Parent
fillmore
fillmore



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```

Child
barack
clinton

Parent
fillmore
fillmore

(Demo)

