# 61A Lecture 32

Friday, April 17

## Announcements

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- Recursive Art Contest Entries due Monday 4/27 @ 11:59pm
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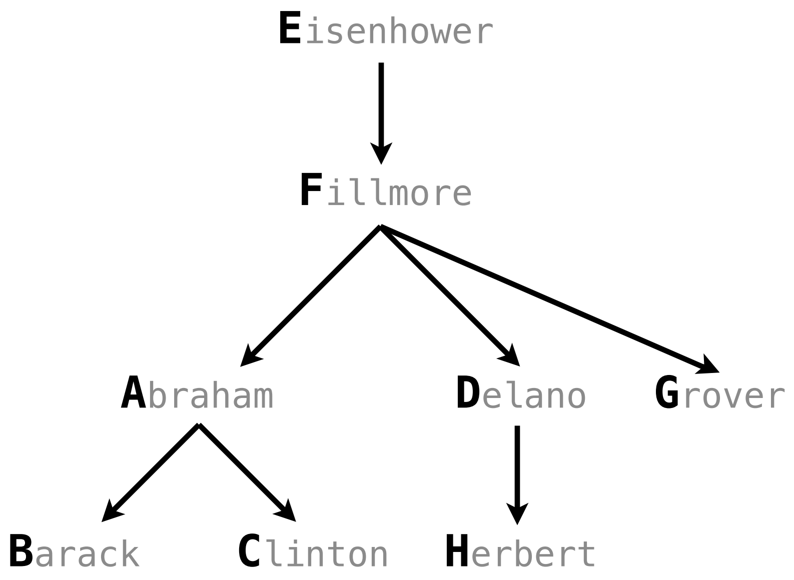
- Homework 9 merged with Homework 10; both are due Wednesday 4/29 @ 11:59pm

## Joining Tables

## Reminder: John the Patriotic Dog Breeder



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select "delano"           , "herbert"         union
select "fillmore"         , "abraham"         union
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select "fillmore"         , "grover"          union
select "eisenhower"       , "fillmore";
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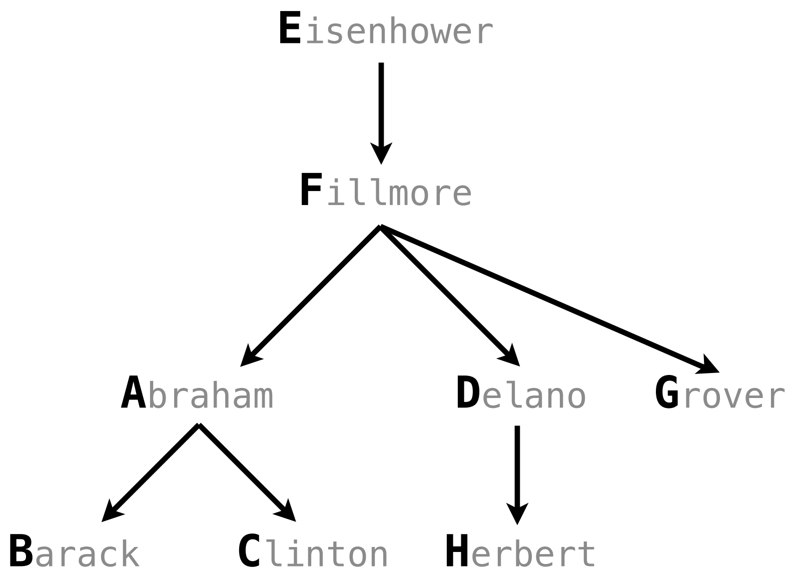

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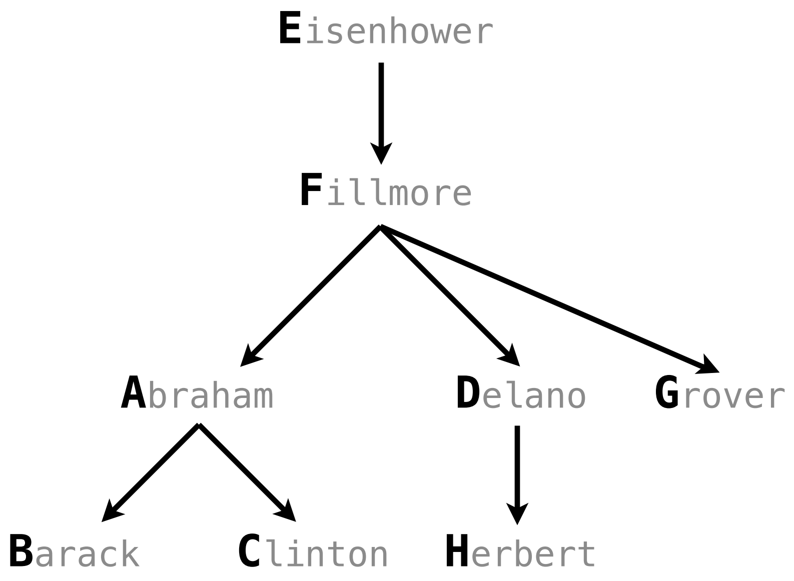

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```

**Parents:**

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

## Joining Two Tables

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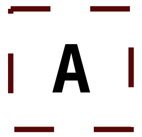

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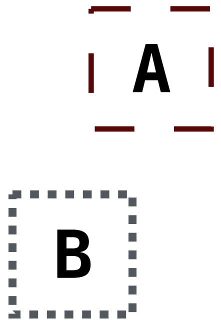

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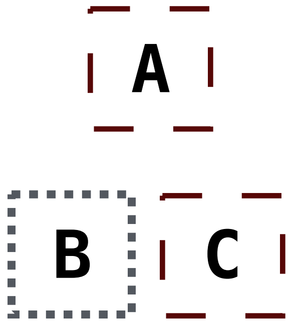

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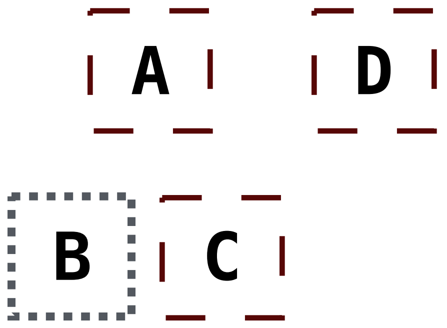

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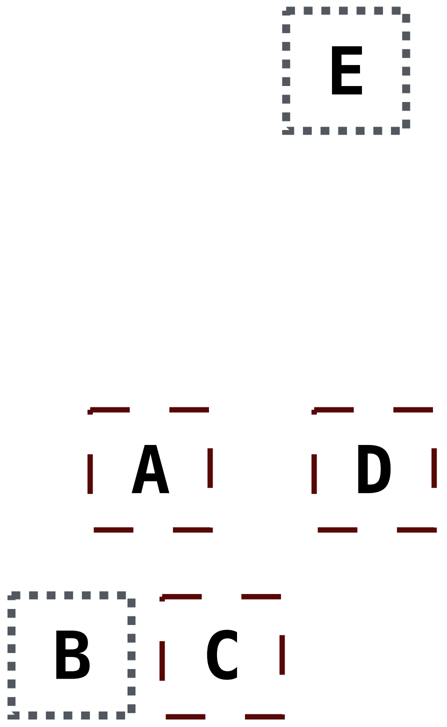

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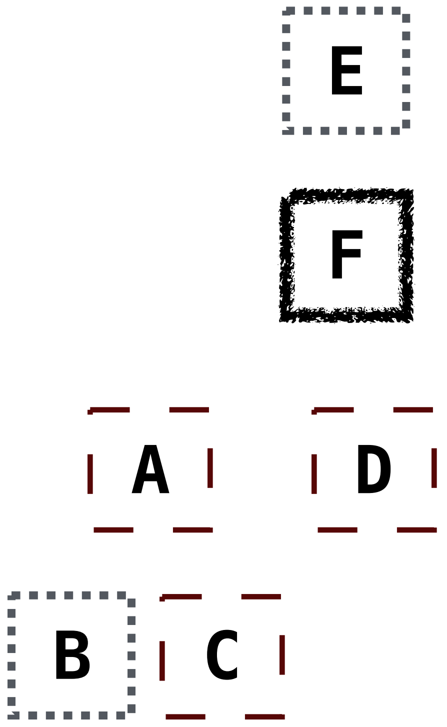

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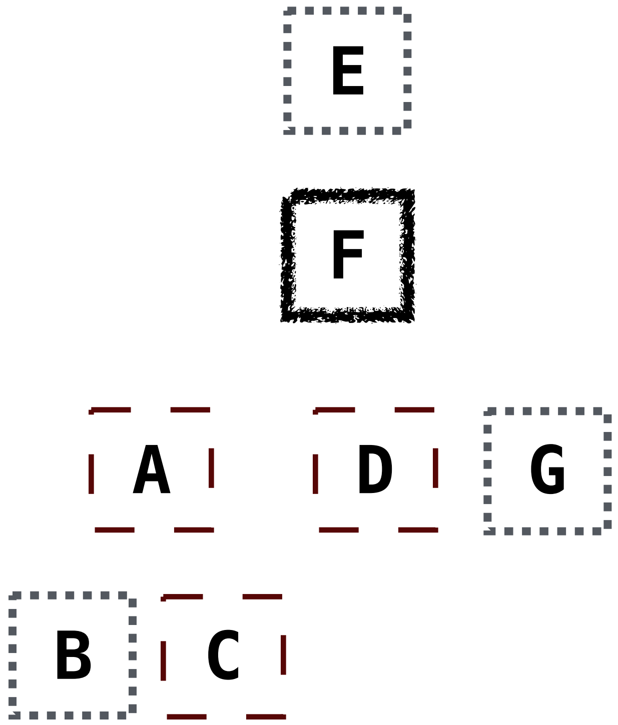

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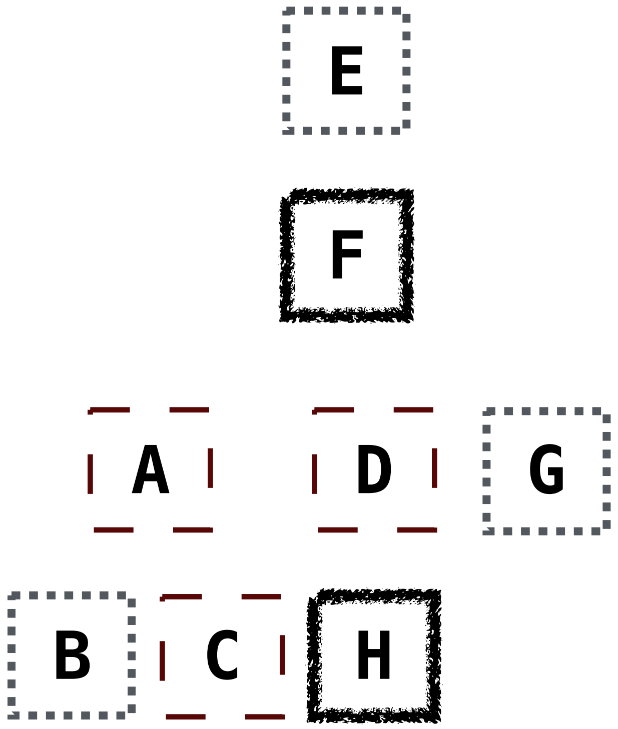

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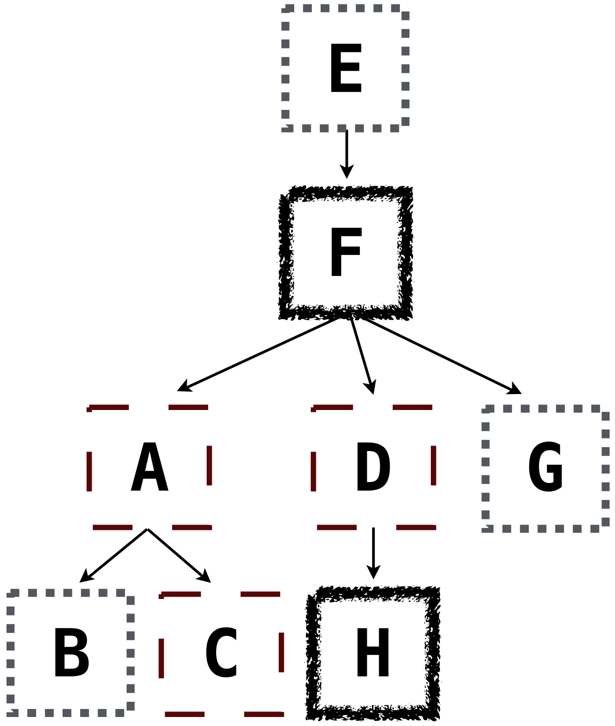

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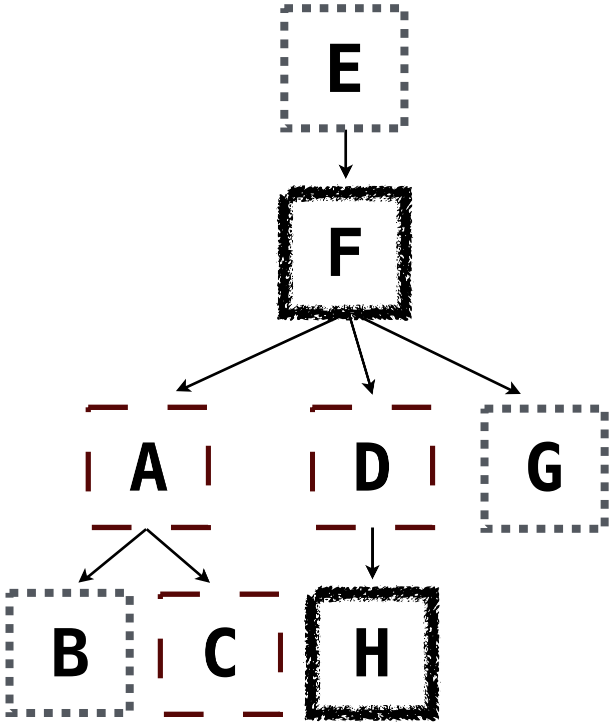
Select the parents of curly-furred dogs



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Select the parents of curly-furred dogs

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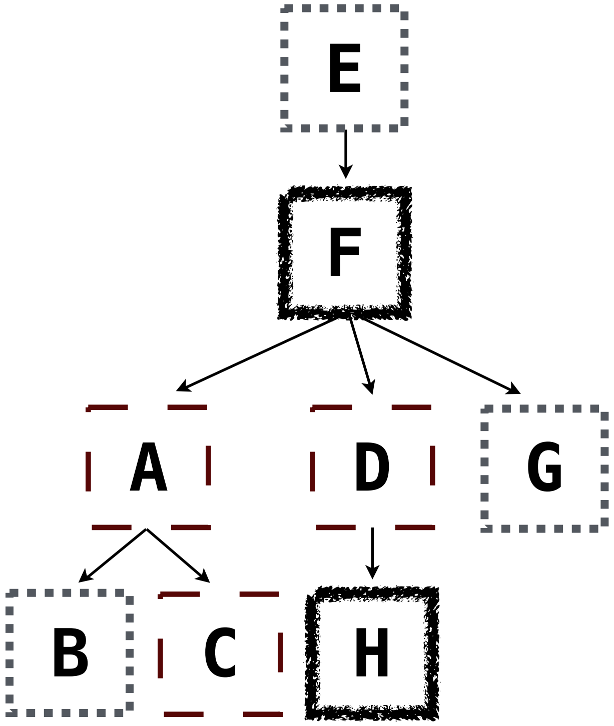

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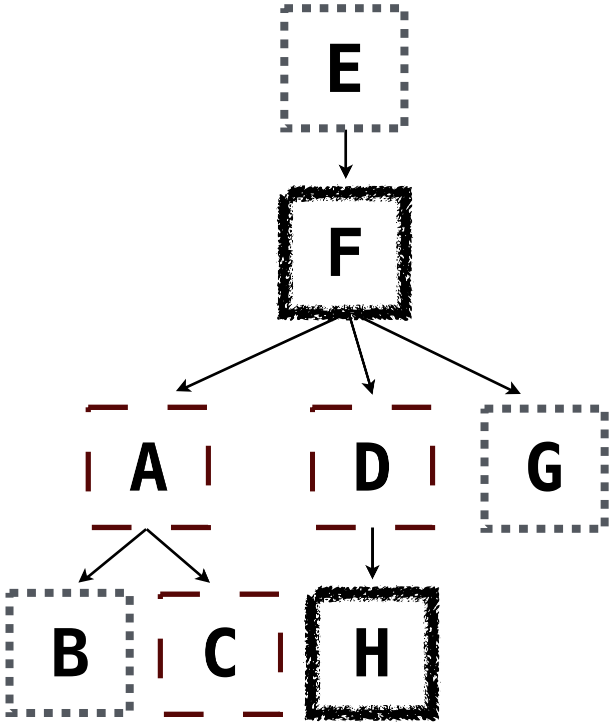

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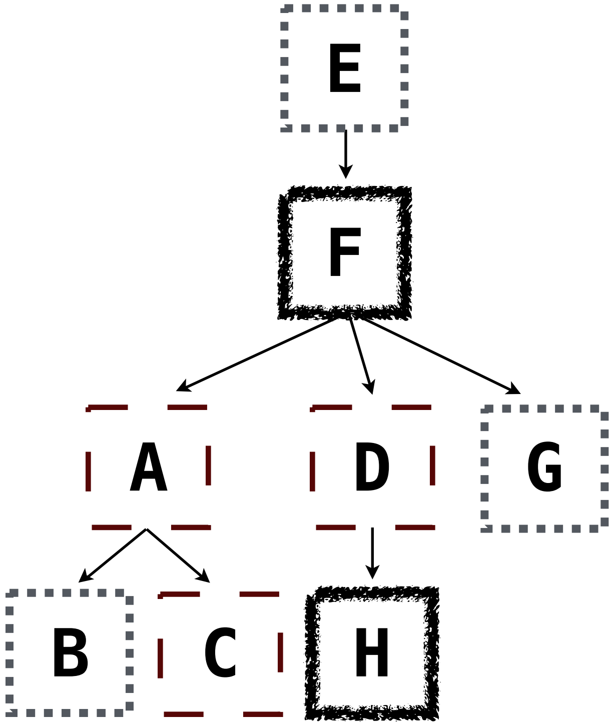

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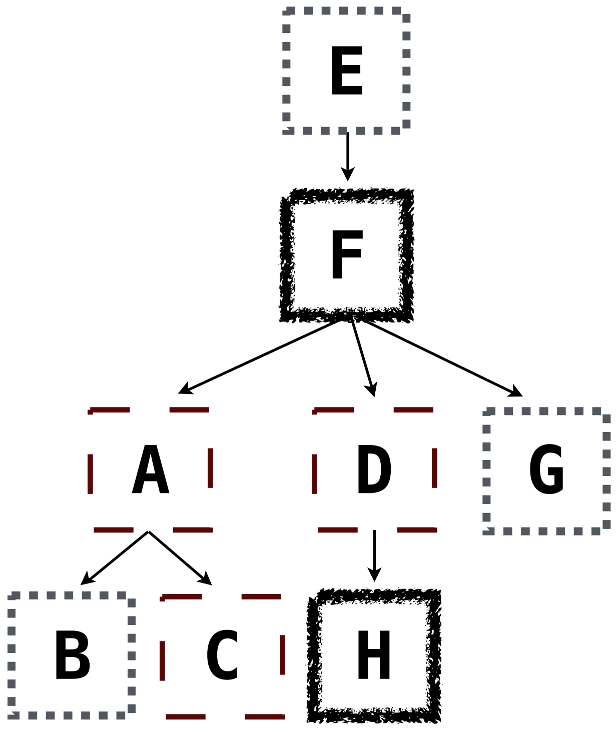
(Demo)

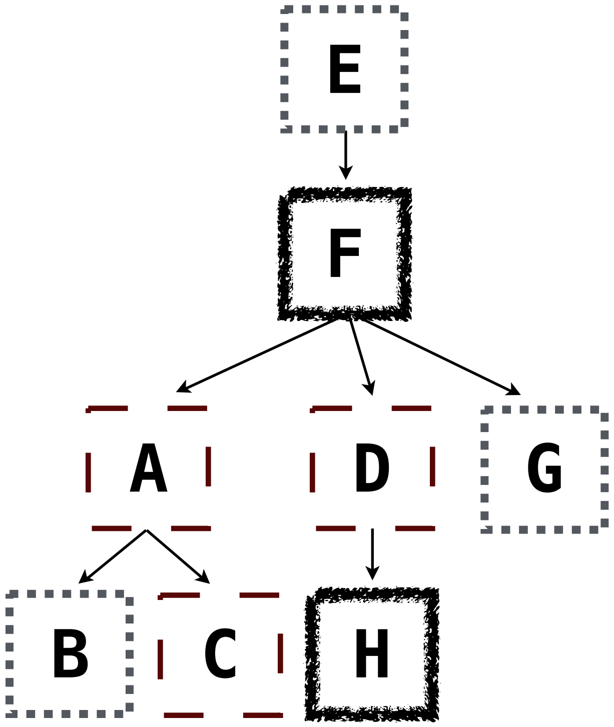
## Aliases and Dot Expressions

## Joining a Table with Itself



## Joining a Table with Itself

Two tables may share a column name; dot expressions and aliases disambiguate column values



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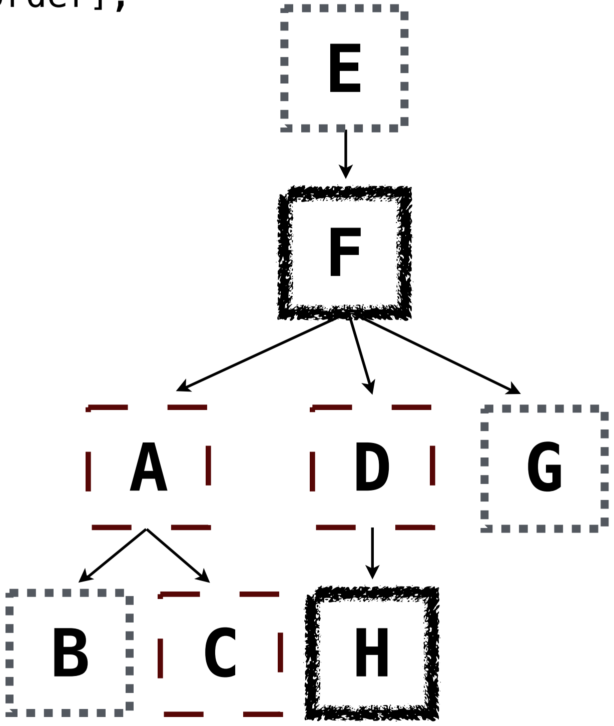

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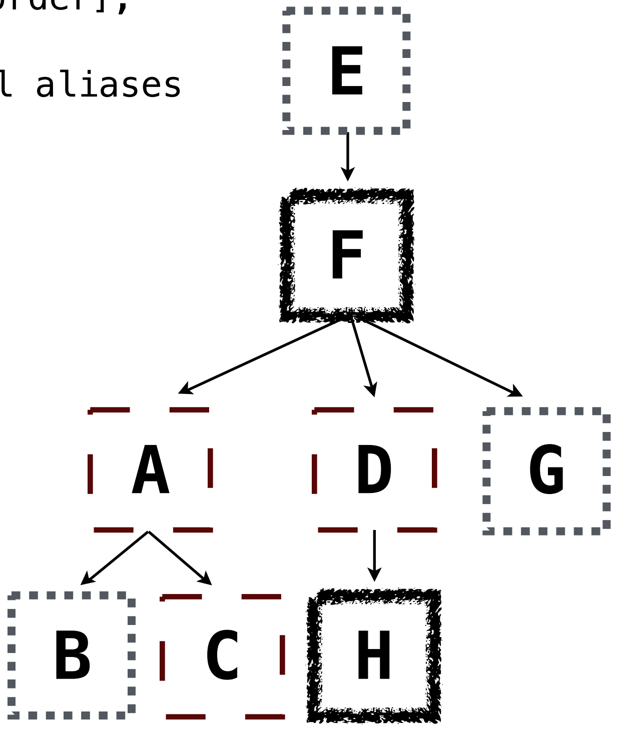
[table] is a comma-separated list of table names with optional aliases



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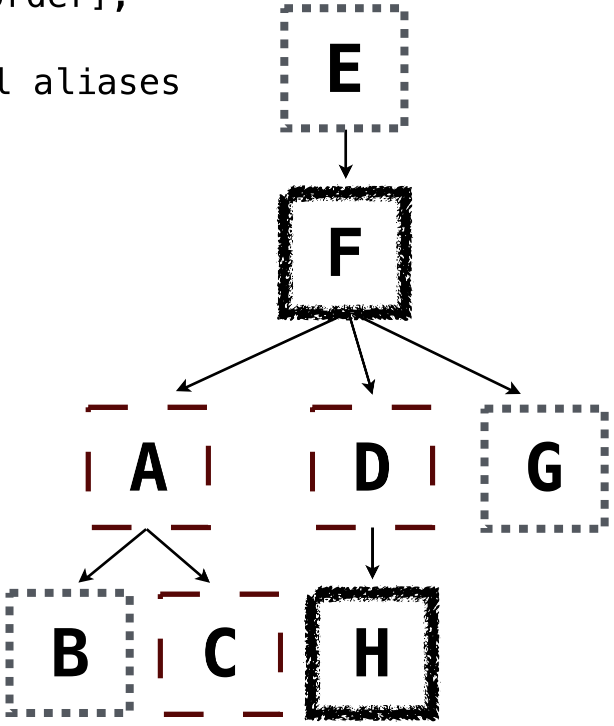
Select all pairs of siblings



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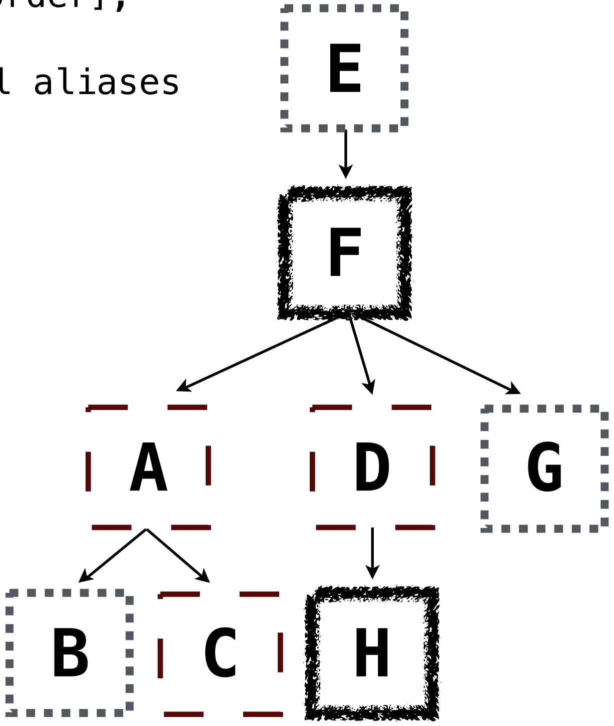
```
select a.child as first, b.child as second
  from parents as a, parents as b
  where a.parent = b.parent and a.child < b.child;
```



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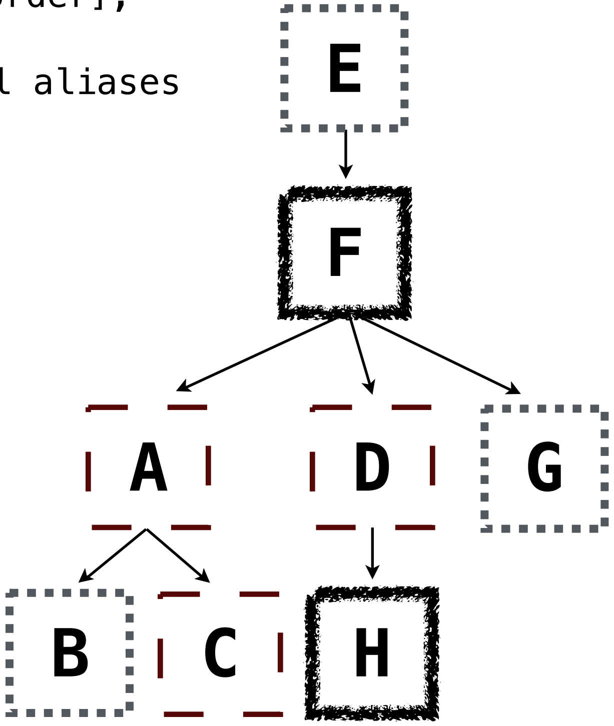

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Select all pairs of siblings

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```
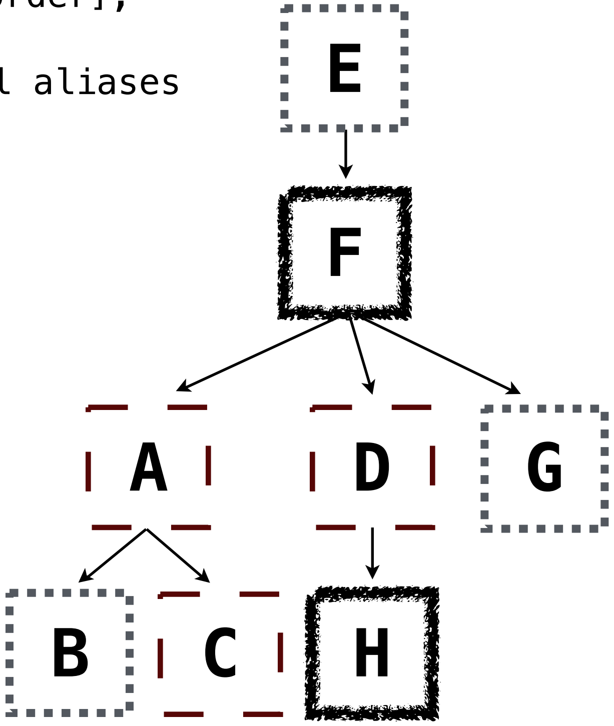

| First | Second |
|---|---|
| barack | clinton |
| abraham | delano |
| abraham | grover |
| delano | grover |



## Example: Grandparents

Which select statement evaluates to all grandparent, grandchild pairs?

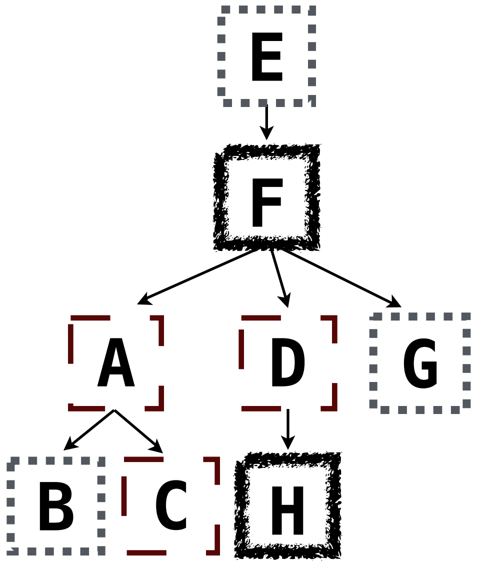
**1**
```
select a.grandparent, b.child from parents as a, parents as b
                                 where b.parent = a.child;
```

**2**
```
select a.parent, b.child from parents as a, parents as b
                             where a.parent = b.child;
```

**3**
```
select a.parent, b.child from parents as a, parents as b
                             where b.parent = a.child;
```

**4**
```
select a.grandparent, b.child from parents as a, parents as b
                                 where a.parent = b.child;
```

**5** None of the above



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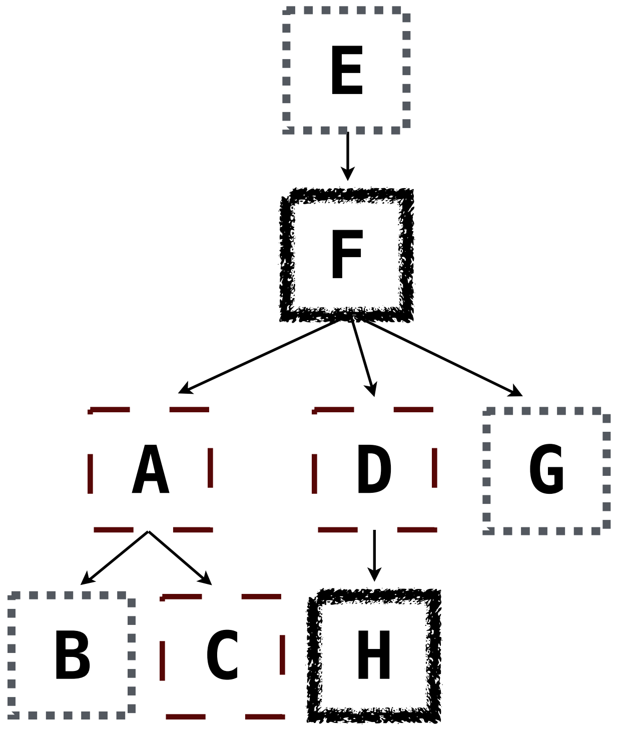
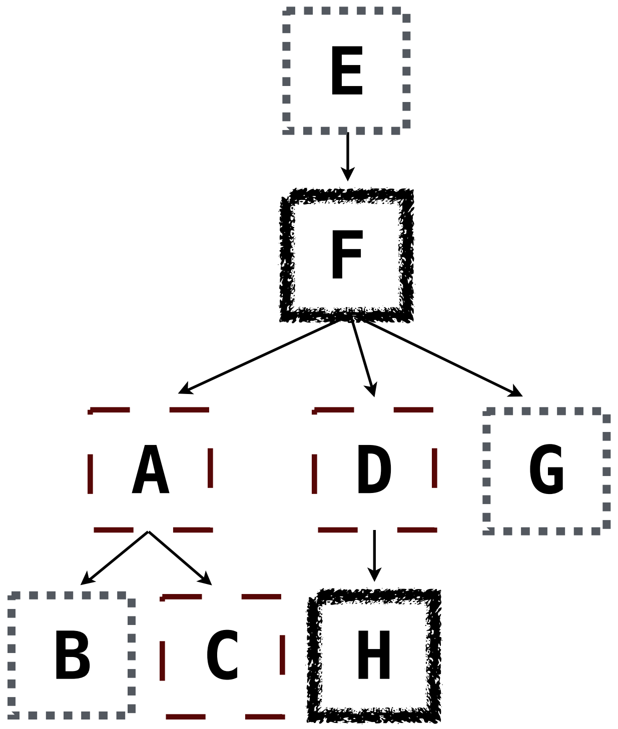


## Joining Multiple Tables

Multiple tables can be joined to yield all combinations of rows from each



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Multiple tables can be joined to yield all combinations of rows from each

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create table grandparents as
  select a.parent as grandog, b.child as granpup
    from parents as a, parents as b
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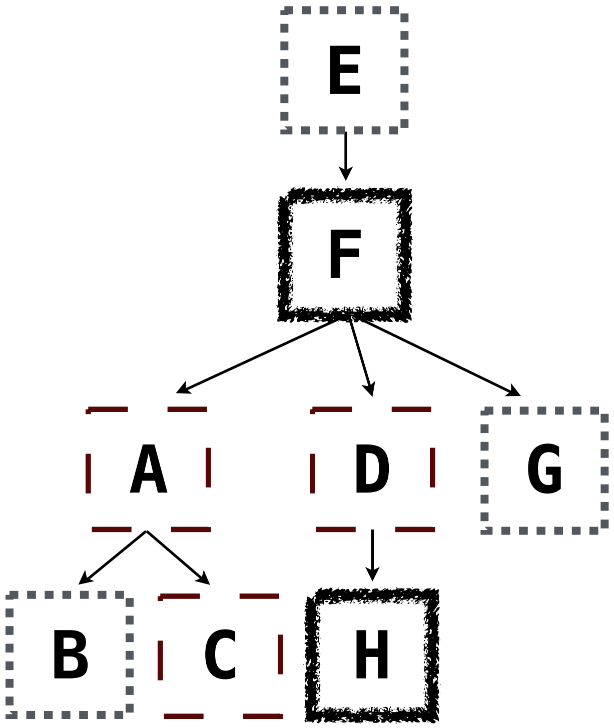

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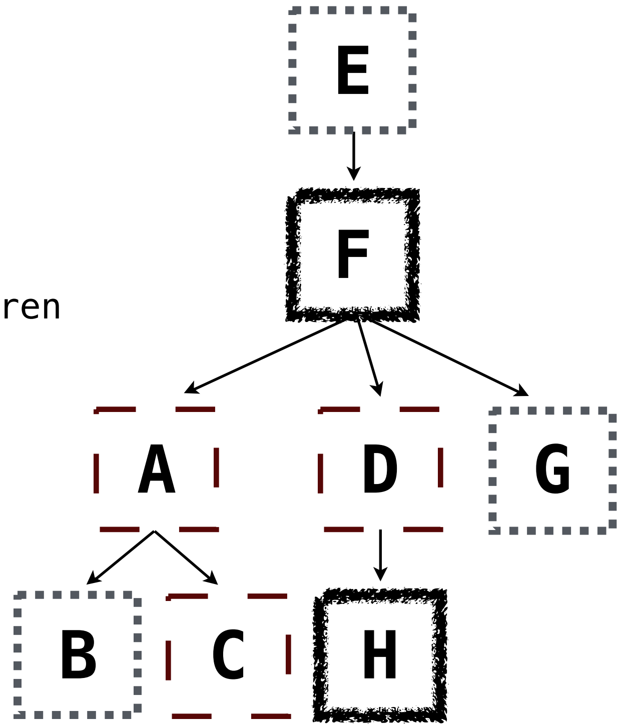
Select all grandparents with the same fur as their grandchildren



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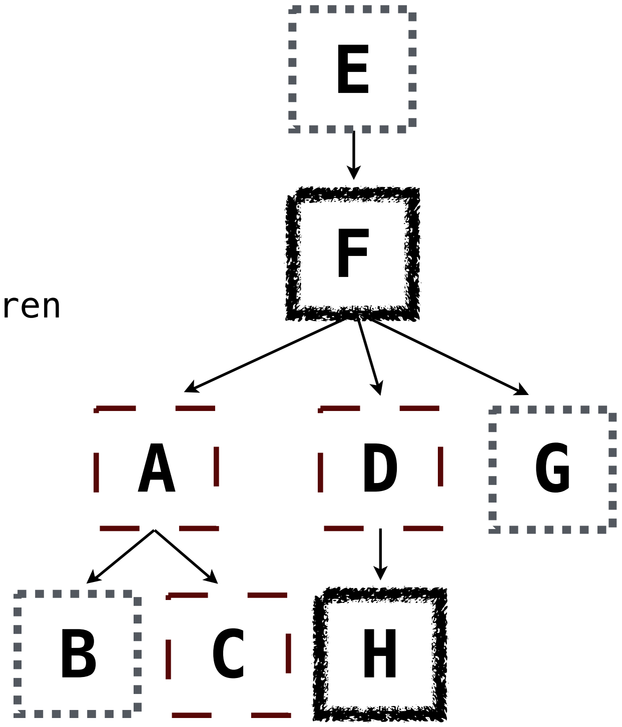
Which tables need to be joined together?



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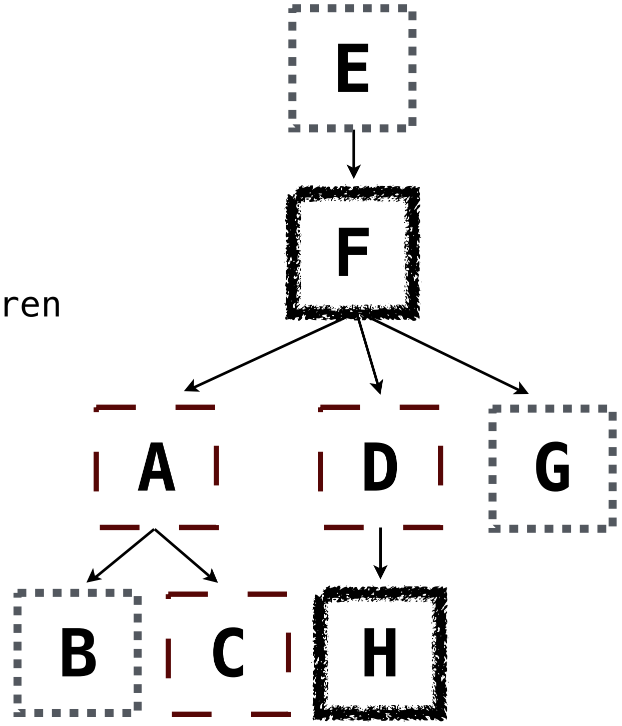
Select all grandparents with the same fur as their grandchildren

Which tables need to be joined together?

```
select grandog from grandparents, dogs as c, dogs as d
               where grandog = c.name and
                     granpup = d.name and
                     c.fur = d.fur;
```



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(Demo)

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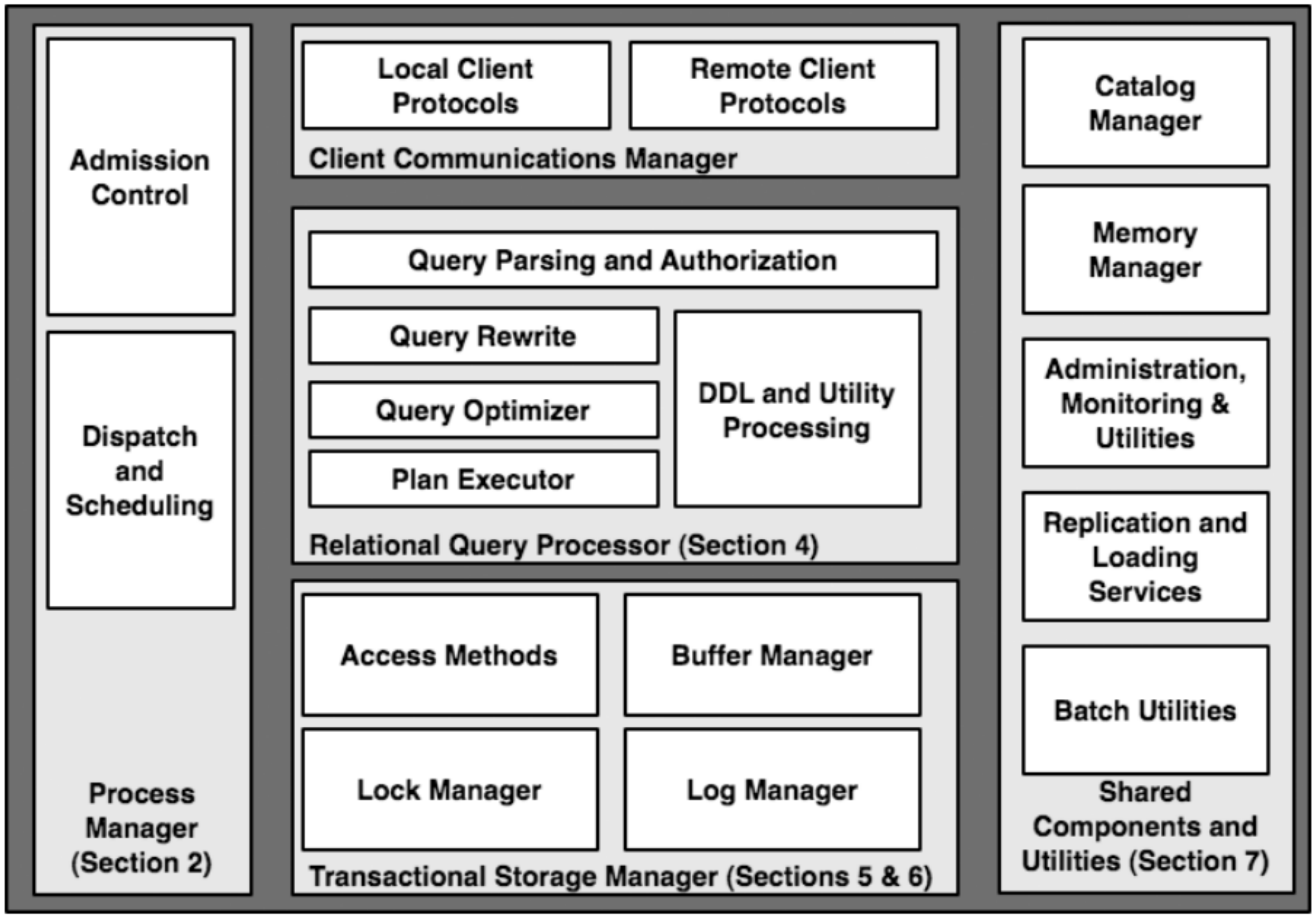
(Demo)

## Database Management Systems

## Database Management System Architecture


Admission Control
Dispatch and Scheduling
Process Manager (Section 2)
Local Client Protocols
Remote Client Protocols
Client Communications Manager
Query Parsing and Authorization
Query Rewrite
Query Optimizer
Plan Executor
DDL and Utility Processing
Relational Query Processor (Section 4)
Access Methods
Buffer Manager
Lock Manager
Log Manager
Transactional Storage Manager (Sections 5 & 6)
Catalog Manager
Memory Manager
Administration, Monitoring & Utilities
Replication and Loading Services
Batch Utilities
Shared Components and Utilities (Section 7)

Architecture of a Database System by Hellerstein, Stonebreaker, and Hamilton

## Query Planning

`The manner in which tables are filtered, sorted, and joined affects execution time`

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