

Exercise: Recursive SQL Queries

Consider the relation Ancestors (pNr, personName, gender, birthYear, birthMonth, mother, father) which describes the ancestry of persons. Mother and father are foreign keys referencing pNr. They describe for a given person which persons are their mother and father.

Write the following query in SQL:

List the names and birthYears of all persons who are born in September and who are descendants in the female line of persons named Marie Curie¹.

"In the female line" means: at each level you look for all children, but for the next step further down you need to consider again only those who are mothers. (This is easier to write than the more general case).

1. Marie Curie was a female Polish-French physicist who discovered radioactivity and received Nobel prizes in physics and in chemistry. Her daughter also won the Nobel prize for chemistry.

Solution Example: Recursive SQL Queries

First, we create a table to be used for this query:

```
CREATE TABLE Ancestors
(pNr INT PRIMARY KEY,
personName varChar(40),
gender CHAR(1),
birthYear INT,
birthMonth INT,
motherNr INT,
fatherNr INT,
FOREIGN KEY(motherNr) REFERENCES Ancestors(pNr)
ON DELETE SET NULL ON UPDATE CASCADE,
FOREIGN KEY(fatherNr) REFERENCES Ancestors(pNr)
ON DELETE SET NULL ON UPDATE CASCADE);
```

Next, we enter some data:

```
INSERT INTO Ancestors VALUES
(1, "Marie Curie", "f", 1867, 11, NULL, NULL),
(2, "Pierre Curie", "m", 1859, 5, NULL, NULL),
(3, "Irene Joliot-Curie", "f", 1897, 9, 1, 2),
(4, "Eve Curie", "f", 1904, 12, 1, 2),
(5, "Henry Labouisse", "m", 1904, 2, NULL, NULL),
(6, "Frederic Joliot-Curie", "m", 1900, 3, NULL, NULL),
(7, "Anne Peretz", "f", 1937, 7, 4, 5),
(8, "Helene Langevin-Joliot", "f", 1927, 9, 3, 6);
1
```

Finally, here is the recursive query to answer the problem's question:

```
WITH RECURSIVE Descendants (pNr, personName, birthYear, birthMonth) AS
(SELECT pNr, personName, birthYear, birthMonth
FROM Ancestors
WHERE motherNr IN
    (SELECT pNr
    FROM Ancestors
    WHERE personName = "Marie Curie")
UNION ALL
(SELECT Ancestors.pNr, Ancestors.personName, Ancestors.birthYear,
    Ancestors.birthMonth
FROM Ancestors, Descendants
WHERE Ancestors.motherNr = Descendants.pNr))

SELECT personName, birthYear
FROM Descendants
WHERE birthMonth = 9;
```

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1. Please note that Anne Peretz was a step-daughter of Eve Curie I do not know her correct month of birth, so I have simply invented July 1937. The NULL values mean I don't have the correct data here.