ID	*name*	*dept_name*	*salary*
22222	Einstein	Physics	95000
12121	Wu	Finance	90000
32343	El Said	History	60000
45565	Katz	Comp. Sci.	75000
98345	Kim	Elec. Eng.	80000
76766	Crick	Biology	72000
10101	Srinivasan	Comp. Sci.	65000
58583	Califieri	History	62000
83821	Brandt	Comp. Sci.	92000
15151	Mozart	Music	40000
33456	Gold	Physics	87000
76543	Singh	Finance	80000

Figure 2.4 Unsorted display of the *instructor* relation.

We require that, for all relations r, the domains of all attributes of r be atomic. A domain is **atomic** if elements of the domain are considered to be indivisible units. For example, suppose the table *instructor* had an attribute *phone_number*, which can store a set of phone numbers corresponding to the instructor. Then the domain of *phone_number* would not be atomic, since an element of the domain is a set of phone numbers, and it has subparts, namely, the individual phone numbers in the set.

The important issue is not what the domain itself is, but rather how we use domain elements in our database. Suppose now that the *phone_number* attribute stores a single phone number. Even then, if we split the value from the phone number attribute into a country code, an area code, and a local number, we would be treating it as a non-atomic value. If we treat each phone number as a single indivisible unit, then the attribute *phone_number* would have an atomic domain.

The **null value** is a special value that signifies that the value is unknown or does not exist. For example, suppose as before that we include the attribute *phone_number* in the *instructor* relation. It may be that an instructor does not have a phone number at all, or that the telephone number is unlisted. We would then have to use the null value to signify that the value is unknown or does not exist. We shall see later that null values cause a number of difficulties when we access or update the database, and thus they should be eliminated if at all possible. We shall assume null values are absent initially, and in Section 3.6 we describe the effect of nulls on different operations.

The relatively strict structure of relations results in several important practical advantages in the storage and processing of data, as we shall see. That strict structure is suitable for well-defined and relatively static applications, but it is less suitable for applications where not only data but also the types and structure of those data change over time. A modern enterprise needs to find a good balance between the efficiencies of structured data and those situations where a predetermined structure is limiting.