

## 2.2 Abstract states of affairs

States of affairs are either abstract or concrete. An abstract state of affairs can be realized (instantiated) in different ways. For instance, the abstract state of affairs that somebody gives something to somebody else is realized by the concrete state of affairs that John gives Mary a book, but also by the concrete state of affairs that Russia gives the Netherlands a collection of drawings.

Abstract states of affairs are denoted by a term for a state of affairs that contains at least one free variable. For instance:

- $*\text{rescued}(\text{tarzan}, y)$  denotes the abstract state of affairs that Tarzan rescued somebody. Notice that this expression is a term that denotes a state of affairs. In particular it should be distinguished from the sentence  $(\exists y)\text{Rescued}(\text{tarzan}, y)$ , which expresses (rather than denotes) the concrete state of affairs that there is a person that Tarzan rescued and from the term  $*(\exists y)\text{Rescued}(\text{tarzan}, y)$ , which denotes this last concrete state of affairs.
- $*\text{gives}(x, \text{a\_book}, y) \ \& \ (x \neq y)$  denotes the abstract state of affairs that somebody gives a book to somebody else.

Concrete states of affairs can instantiate abstract ones. A concrete state of affairs  $*s$  instantiates an abstract state of affairs  $*s'$ , if and only if there is some substitution  $i$  such that the term that typically denotes  $*s$  is the result of uniformly substituting all variables in the term that typically denotes  $*s'$  by constants according to  $i$ .

In this connection the function `instantiation/2` is relevant. The first parameter of this function is an abstract state of affairs and the second an instantiation. Its value is the concrete state of affairs that results from replacing all free variables in the first parameter by constants according to the instantiation of the second parameter. For instance:

$*s = \text{instantiation}(*s', i)$

Whereas states of affairs can be both abstract and concrete, facts are always concrete.

### 3. REASONS

#### 3.1 Kinds of reasons

The central notion in Reason-based Logic is that of a reason. There are several kinds of reasons, which have in common that they are facts which are relevant for other facts. These other facts are called the *conclusions* of these reasons.<sup>13</sup>

One use of ‘reason’ occurs in sentences like ‘The reason why the string broke was that it was under a too high tension’. In this context a reason is relevant for its consequence because it is a cause. Next to reasons in the sense of causes, it is possible to distinguish between reasons why something is the case (constitutive reasons), reasons to believe and reasons for action. For instance, the facts that P owns so many dollars and that nobody else owns more, are (together) the constitutive reason why P *is* the richest person in the world. That X read in the newspaper that P owns so many dollars is a reason for X *to believe* that P is the richest person in the world. That P is the richest person in the world is a reason for journalist Y *to interview* him. Unlike reasons in the sense of causes, constitutive reasons, reasons to believe and reasons for action<sup>14</sup> can be adduced in arguments which lead to the conclusion that something is the case (constitutive reasons and reasons to believe) or that something should (not) be done. In this way reasons can play a role in reasoning. By mentioning facts that are reasons, one can reason for a particular conclusion.

RBL deals with constitutive reasons, reasons why something else is the case. This ‘something else’ can take many different forms. There can, for instance, be constitutive reasons why:

1. John is a thief
2. Thieves are punishable.
3. Victoria is smarter than Isis
4. This is a beautiful picture
5. It is reasonable to believe that the butler killed Lord Hard
6. Jane ought to repay her loan.
7. One should give to the poor.

<sup>13</sup> Reasons are discussed extensively in chapter 2 of Hage 1997 (RwR).

<sup>14</sup> I take reasons for action here in the sense of guiding (or normative) reasons, not that of motivating (or explanatory) reasons. For the difference between these two kinds of reasons, see Raz 1975, 15f., Smith 1994, 94f. and Redondo 1999, 1f.

As the examples 5-7 illustrate, constitutive reasons include reasons to believe and reasons to act. By treating reasoning about what to do as reasoning about what ought to be done, or what should be done and by treating reasoning about beliefs as reasoning about what it is rational to believe, these kinds of reasoning can be dealt with by means of RBL.

### 3.2 Decisive reasons

RBL distinguishes between *contributive reasons* and *decisive reasons*. Decisive reasons are concrete reasons<sup>15</sup> that determine their conclusions. If a decisive reason for a conclusion obtains, the conclusion also obtains. For instance, the facts that there are two horses and four cows and no other animals are together a decisive reason why there are six animals.

It makes no sense to weigh decisive reasons against other reasons. If there are contributing reasons that collide with a decisive reason, the decisive reason wins by definition, so there is no need for weighing. If there would be colliding decisive reasons, this would make their conclusions incompatible. Since there cannot be incompatible states of affairs, there cannot be colliding decisive reasons either, and sentences that express colliding decisive reasons are therefore inconsistent.

RBL has a dedicated predicate constant  $Dr/2$  to express that a fact is a decisive reason for some other fact. For instance, the following sentence expresses that the fact that John is older than Derek is a decisive reason why Derek is younger than John:

```
Dr(*older_than(john, derek),
  *younger_than(derek, john))
```

Because all concrete reasons are facts, it holds as an axiom of RBL that:

#### Decisive reason is fact:

$$\forall *a(\exists *b(Dr(*a, *b)) \rightarrow \text{Obtains}(*a))$$

Moreover, because a decisive reason guarantees that its conclusion obtains, it holds as an axiom that:

#### Conclusion decisive reason obtains:

$$\forall *b(\exists *a(Dr(*a, *b)) \rightarrow \text{Obtains}(*b))$$

From these two axioms and the definition of the predicate `Obtains` it follows that

$$\forall *a *b(Dr(*a, *b) \rightarrow (A \ \& \ B))$$

<sup>15</sup> The distinction between concrete and abstract reasons is discussed in section 3.5.

### 3.3 Contributive reasons

Just like decisive reasons, contributive reasons are concrete reasons. In opposition to decisive reasons, contributing reasons do not determine their conclusions by themselves. There can both be contributing reasons that plead for, and contributive reasons that plead against a particular conclusion. Assuming that there are no relevant decisive reasons, it is the set of *all* contributing reasons concerning a particular conclusion, both the reasons pro and con, which determines whether the conclusion holds.

For instance, if somebody breaks the window of somebody else's house in order to save a child from the house that is burning, the question whether this behavior is lawful depends on the relative weight of two contributing reasons. One reason is that the behavior was an infringement of somebody else's property. This reason pleads *against* the lawfulness of the behavior. The other reason is that the act was necessary to save a human life. This reason pleads *for* the lawfulness of the behavior. If these two are all the relevant reasons, they determine together whether the behavior in question was lawful.

RBL has a dedicated predicate constant  $Cr/2$  to express that some fact is a contributive reason for some state of affairs. For instance the following sentence expresses that the fact that John is a thief is a contributive reason why he is punishable:

$$Cr(*thief(john), *punishable(john))$$

There can also be contributive reasons against a conclusion. To avoid the necessity of a special predicate constant for the expression of contributive reasons against a conclusion, these *con-reasons* are expressed as if they were *pro-reasons* for the negated conclusion. For instance, the fact that the weather report predicted sunshine is a contributive reason against the conclusion that it will be raining:

$$Cr(*prediction\_sunshine, *\sim rain)$$

Because all concrete reasons are facts, it holds as an axiom of RBL that:

**Contributive reason is fact:**

$$\forall *a(\exists *b(Cr(*a, *b)) \rightarrow Obtains(*a))$$

### 3.4 Weighing contributive reasons

A crucial aspect of contributive reasons is that *they have to be weighed* (or *balanced*; I use these words interchangeably) against contributive reasons pleading in a different direction. To avoid misunderstandings, I want to

stress that this weighing is not a psychological process. It does not even need to be accompanied by a psychological process. From a logical point of view it does not matter what goes on psychologically. The only thing that matters is that somehow information must be available that indicates which set of reasons outweighs the other set. This information needs not be available in advance to guide a decision making process; it can also be the outcome of such a process. From the logical point of view, information about the relative weights of the sets of reasons is merely a presupposition of a valid argument in which a conclusion is drawn from contributive reasons for and/or against this conclusion.

To formalize this kind of argument, RBL needs function constants to denote sets of reasons. The function constant  $r^+/1$  denotes the set of all contributive reasons pleading for a conclusion, while  $r^-/1$  denotes the set of all contributive reasons pleading against a conclusion.

If  $*a$  denotes a concrete state of affairs, then  $r^+(*a)$  denotes the set of all contributive reasons pleading for  $*a$ :

**Definition set of contributive pro-reasons:**

$$r^+(*a) = \{ *s \mid Cr(*s, *a) \text{ is true} \}.$$

$r^-(*a)$  denotes the set of all contributive reasons pleading against  $*a$ :

**Definition set of contributive con-reasons:**

$$r^-(*a) = \{ *s \mid Cr(*s, *\sim a) \text{ is true} \}.$$

For example,  $r^+(*rain)$  denotes the set of all reasons why there will be rain, while  $r^-(*rain)$  denotes the set of all reasons why there will not be rain.

Contributive reasons need to be weighed. Psychologically, this weighing often boils down to taking a decision which set of reasons outweighs the other set. However, as already stressed, from the logical point of view the only thing that matters is that information about the relative weight is needed as a premise in a valid argument.

The information which set of reasons outweighs the other set is expressed in so-called *weighing knowledge*. RBL has a dedicated relation constant to express weighing knowledge:  $>_{conclusion}/2$ , which operates on sets of reasons. For instance, the sentence

$$\{ *prediction\_sunshine \} >_{*rain} \{ *cloudy, rain\_yesterday \}$$

expresses that the set containing the single reason that sunshine was predicted by the weather forecast, with regard to the conclusion that it will rain, outweighs the set containing the reasons that it is cloudy and that it

rained yesterday. Often the subscript of the *Outweighs*-predicate is superfluous because the context makes it clear for and against which conclusion the reasons plead. Then the subscript is omitted.

If the contributive reasons pleading for a conclusion outweigh the contributive reasons pleading against it and there is no decisive reason against this conclusion, the conclusion holds:

**Outweighing pro-reasons:**

$$\forall *s (r^+(*s) > r^-(*s) \ \& \ \sim \exists *x (Dr(*x, *s)) \rightarrow \text{Obtains}(*s))$$

If the contributive reasons pleading against a conclusion outweigh the contributive reasons pleading for it and there is no decisive reason for this conclusion, the negation of the conclusion holds:

**Outweighing con-reasons:**

$$\forall *s (r^+(*s) > r^-(*s) \ \& \ \sim \exists *x (Dr(*x, *s)) \rightarrow \text{Obtains}(*\sim s))$$

### 3.5 Abstract reasons

If a particular fact is a reason for some conclusion, similar facts will normally be reasons for similar conclusions. Suppose, for instance, that the fact that the weather forecast this morning predicted that it will rain this afternoon is a reason to assume that it will rain this afternoon. In that case, the fact that in the morning the weather forecast predicts rain will in general be a reason to assume that it will rain that afternoon. Similarly, being a thief is an abstract contributive reason for being punishable, because the fact that some particular person is a thief, is normally a contributive reason why this person is punishable. This phenomenon, that concrete reasons are instantiations of more abstract ones, has become known, especially in ethical theory, as the universalizability of reasons.<sup>16 17</sup>

In RBL, all contributive reasons are assumed to be instantiations of abstract reasons.<sup>18</sup> RBL has a dedicated predicate constant  $Ar/2$  to express that some abstract state of affairs is an abstract contributive reason for some

<sup>16</sup> Cf. Hare 1981, 107f.

<sup>17</sup> In my 1996 and 1997 (RwR), I hardly paid attention to abstract reasons and instead wrote about (the validity of) principles. This may have created the wrong impression that these principles would possess some kind of independent status apart from that some type of fact tends to be a reason for some type of conclusion. (e.g. as so-called ‘legal principles’.) To avoid this impression, I discuss this topic here in terms of abstract and concrete reasons.

<sup>18</sup> Decisive reasons are considered to be instantiations of rules, about which more in section 7

(other abstract) state of affairs. For instance the following sentence expresses that being a thief is a contributive reason for being punishable:

$$\text{Ar}(*\text{thief}(x), *\text{punishable}(x))$$

The universalizability of contributive reasons is expressed by the following axiom of RBL:

**Universalizability of contributive reasons:**

$$\begin{aligned} &\forall *r, *c (\text{Cr}(*r, *c) \rightarrow \\ &\quad \exists *r', *c', i (\text{Ar}(*r', *c') \ \& \\ &\quad \quad *r = \text{Instantiation}(*r', i) \ \& \\ &\quad \quad *c = \text{Instantiation}(*c', i))) \end{aligned}$$

If some fact instantiates an abstract contributive reason for some abstract conclusion, this fact is normally a concrete contributive reason for the relevant instantiation of the abstract conclusion. For instance, if

$$P(a) \ \& \ \text{Ar}(*p(x), *c(x))$$

is true, then

$$\text{Cr}(*p(a), *c(a))$$

will *normally* also be true.

Sometimes instantiations of abstract reasons are not contributive reasons. This happens in particular if there is a reason why a kind of fact that is normally a reason for some conclusion should not be taken into consideration. Take the following example: John has promised his mother in law to visit her on Sunday afternoon. After the promise, he finds out that there will be a unique concert by his favorite artist that same afternoon. Normally, John would have to balance the obligation stemming from the promise against his desire to visit the concert in order to decide what he should do. John happens to find out, however, that his mother in law will have other visitors too that afternoon, while she gave him the impression that she would be all alone if John would not visit her. Knowing this, John does not feel bound by his promise anymore and there is no need to balance reasons in order to decide what to do. The only relevant reason is the unique concert and because of this reason John decides to visit the concert.<sup>19</sup>

<sup>19</sup> Another example is that some contributive reason for a conclusion has already been taken into account in an applicable rule. Then the rule determines which conclusion holds and the contributive reasons that went into the rule are not taken into consideration anymore.

This topic is discussed extensively by Raz (1975, 35f.) under the heading of ‘exclusionary reasons’ and by Schauer (1991, 38f.) under the heading of ‘entrenchment’. See also Hage 1997 (RwR), 110f. about rules and ‘replacing reasons’.

When the step from an abstract reason to its instantiation as contributive reason is not valid, we say that the abstract reason is *excluded*. The language of RBL uses the predicate constant `Excluded/2` to express such an exclusion. Its parameters are the relevant instantiations of the abstract reason and its conclusion. For instance, if  $Ar(*p(x), *c(x))$  is true,  $Excluded(*p(a), *c(a))$  expresses the lack of relevance of this abstract reason for the instantiation of  $x$  by  $a$ . If an abstract reason is not excluded, its instantiation by a state of affairs that obtains is a contributive reason:

**Instantiation of abstract reason:**

Let  $*ip$  be an instantiation of  $*p$  under some substitution of the variables in  $*p$  and let  $*ic$  be the instantiation of  $*c$  under the same substitution of variables. Then it holds that:

$$Ar(*p, *c) \ \& \ Ip \ \& \ \sim Excluded(*ip, *ic) \ \rightarrow \ Cr(*ip, *ic)$$

The exclusion of abstract reasons illustrates a phenomenon that occurs more often, namely that states of affairs of a particular type only obtain if there are special reasons for it. Such abstract states of affairs may be called *reason-based states of affairs*.<sup>20</sup> In general an abstract state of affairs is reason-based if its instantiations can only obtain if either there is a decisive reason for it, or the contributive reasons pleading for it outweigh the contributive reasons pleading against it:

**Definition reason-based states of affairs:**

Let  $*as$  denote an abstract state of affairs and let  $*s$  be an instantiation of  $*as$ . Then it holds that

$$\begin{aligned} \forall *as \ (Reason\_based(*as) \equiv \\ \forall *s \ (Obtains(*s) \rightarrow \\ \exists *r \ (Dr(*r, *s) \vee r^+(*s) > r^-(*s))) \end{aligned}$$

<sup>20</sup> Another example of a reason-based state of affairs is the state of affairs that an actor is obligated to perform some kind of behavior. There are no obligations without reasons. Cf. Hare 1963, 30f.



**Exclusion reason-based:**

The abstract state of affairs that an abstract reason is excluded is reason-based.

Reason-based( $*\text{excluded}(*r, *c)$ )

**3.6 Weighing knowledge**

Weighing knowledge is in general contingent, but there are two exceptions concerning the empty set. An empty set of reasons is normally<sup>21</sup> outweighed by any non-empty set and it does not outweigh any set. This is expressed by the following axioms of RBL:

**Empty set of con-reasons in principle outweighed by non-empty set of pro-reasons:**

$$\forall *c (\text{Ar}(*r^-( *c) = \emptyset \ \& \ r^+( *c) \neq \emptyset, \ *r^+( *c) > r^-( *c))$$
**Empty set of pro-reasons in principle outweighed by non-empty set of con-reasons:**

$$\forall *c (\text{Ar}(*r^+( *c) = \emptyset \ \& \ r^-( *c) \neq \emptyset, \ *r^-( *c) > r^+( *c))$$
**Empty set of con-reasons does not outweigh any set of pro-reasons:**

$$\forall *c (*r^-( *c) = \emptyset \rightarrow \sim ( r^-( *c) > r^+( *c) ) )$$
**Empty set of pro-reasons does not outweigh any set of con-reasons:**

$$\forall *c (*r^+( *c) = \emptyset \rightarrow \sim ( r^+( *c) > r^-( *c) ) )$$
**4. REASONING WITH CONTRIBUTIVE REASONS**

To give the reader an impression how reasoning with contributive reasons can be modeled in RBL, I will give an example. One of the more common situations when contributive reasons must be weighed is when deciding what to do. Suppose, for instance, that a public prosecutor is wondering whether she should prosecute Johnny, who is a thief, but also a minor of only 12

<sup>21</sup> There are situations where single reasons do not allow the derivation of the conclusions for which they plead. For instance the fact that the suspect has a motive for committing the murder is a reason to believe that this suspect was the murderer. However, this reason is in itself not sufficient, even in the absence of counter reasons, to draw the conclusion that the suspect committed the murder. Situations like these are exceptions to the principle that any non-empty set of reasons outweighs the empty set.

years old. The fact that Johnny is a thief is a reason to prosecute, but the fact that he is only 12 years old is a reason not to prosecute. This dilemma can be formalized in terms of contributive reasons for and against the conclusion that the public prosecutor should prosecute Johnny:

```
Should_do(public-prosecutor, prosecute(johnny))
```

In this connection two abstract reasons play a role. One is that the public prosecutor should prosecute thieves:

```
Ar(*thief(x),
   *should_do(public-prosecutor, prosecute(x)))
```

The other relevant abstract reason is that the public prosecutor should not prosecute minors:

```
Ar(*minor(x),
   *~should_do(public-prosecutor, prosecute(x)))
```

It both holds that

```
Thief(johnny)
```

and that

```
Minor(johnny).
```

Moreover, I will assume that the two relevant abstraction reasons are not excluded in this case<sup>22</sup>:

```
~Excluded(*thief(johnny),
           *should_do(public-prosecutor, prosecute(johnny)))
~Excluded(*minor(johnny),
           *~Should_do(public-prosecutor, prosecute(johnny)))
```

Given this information, it is possible to derive that

```
Cr(*thief(johnny),
   *should_do(public-prosecutor, prosecute(johnny)))
Cr(*minor(johnny),
   *~should_do(public-prosecutor, prosecute(johnny)))
```

To balance the reasons for and against the conclusion that Johnny should be prosecuted, all relevant reasons should be available. What we have in fact is

<sup>22</sup> This assumption receives further discussion in section 7

one reason for prosecuting and one reason against. We must assume that there are no other relevant reasons<sup>23</sup>:

$$r^+(*\text{should\_do}(\text{public-prosecutor}, \text{prosecute}(\text{johnny})) = \{*\text{thief}(\text{Johnny})\})$$

$$r^-(*\text{should\_do}(\text{public-prosecutor}, \text{prosecute}(\text{johnny})) = \{*\text{minor}(\text{Johnny})\})$$

To draw a conclusion whether the public prosecutor should prosecute, information is needed about the relative weight of these sets of reasons:

$$\{*\text{minor}(\text{johnny})\} > \{*\text{thief}(\text{johnny})\}$$

The (set consisting of the single) fact that Johnny is a minor outweighs the (set consisting of the single) fact that he is a thief (regarding the conclusion that he should be prosecuted).

Given this information, it is possible to derive that the contributive reasons pleading against prosecution outweigh the contributive reasons for prosecution:

$$r^-(*\text{should\_do}(\text{public-prosecutor}, \text{prosecute}(\text{johnny}))) > r^+(*\text{should\_do}(\text{public-prosecutor}, \text{prosecute}(\text{johnny})))$$

To continue, we also need the information that there are no decisive reasons concerning the issue whether the public prosecutor should prosecute Johnny<sup>24</sup>:

$$\sim\exists*r(\text{Dr}(*r, *\text{should\_do}(\text{public-prosecutor}, \text{prosecute}(\text{johnny}))))$$

$$\sim\exists*r(\text{Dr}(*r, *\sim\text{should\_do}(\text{public-prosecutor}, \text{prosecute}(\text{johnny}))))$$

Given the absence of decisive reasons, this leads to the conclusion that the public prosecutor should not prosecute Johnny:

$$\sim\text{Should\_do}(\text{public-prosecutor}, \text{prosecute}(\text{johnny}))$$

<sup>23</sup> Again, this assumption receives further discussion in section 7

<sup>24</sup> This assumption receives further discussion in section 7 too.