



a lot of power in a little structure

$[\{ (, ) , \dots , (, ) \} , , ]$

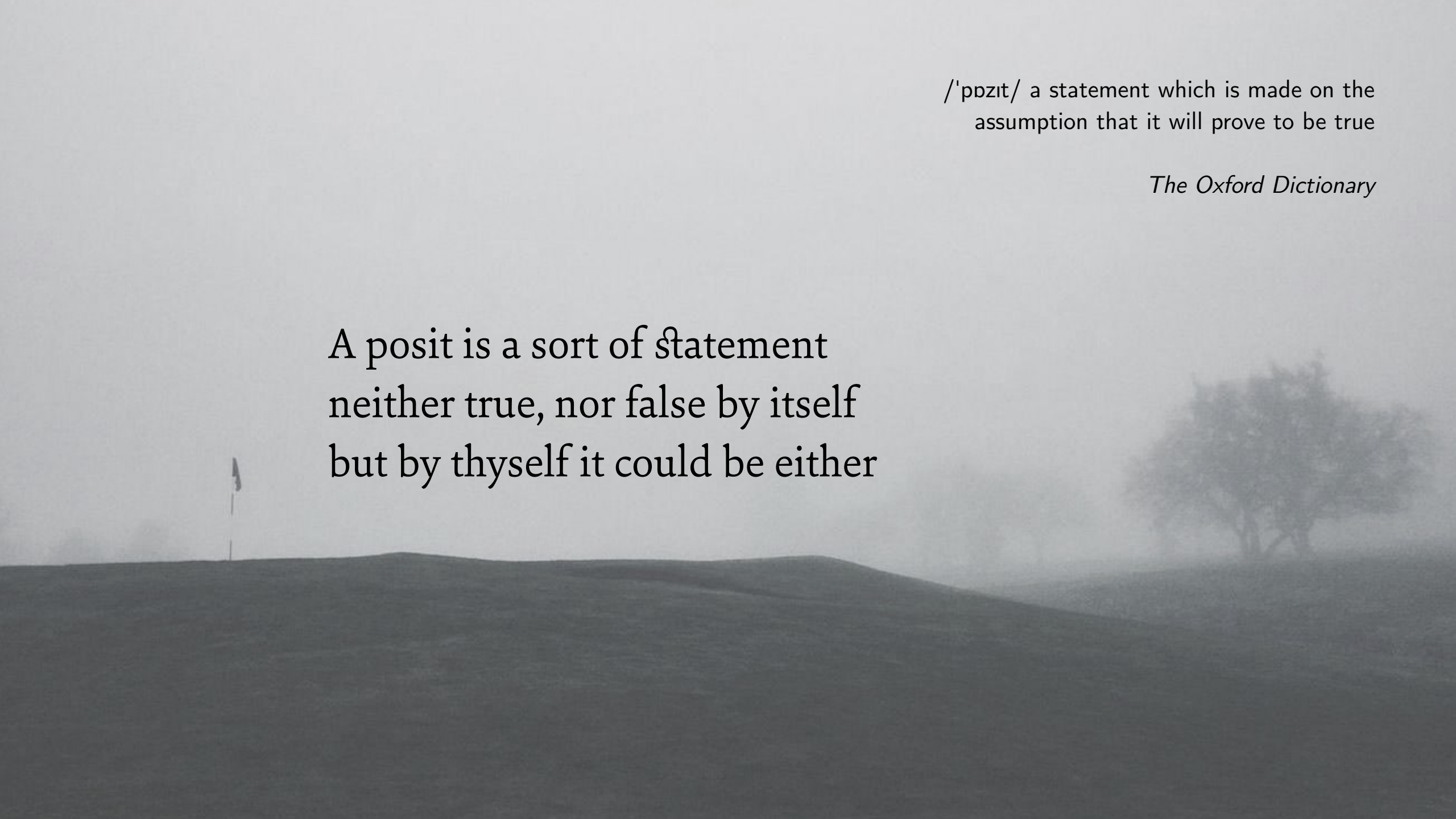
the *posit*

Lars Rönnbäck, copyleft © 2019  
with ideas from player Emma Henrikson

/ˈpɒzɪt/ a statement which is made on the  
assumption that it will prove to be true

*The Oxford Dictionary*

A posit is a sort of statement  
neither true, nor false by itself  
but by thyself it could be either







*posits* are statements about the domain being modeled

$[(,), (,)],,$

$[(,), (,)],,$



42

43

555



*unique identifiers* represent things in real life

$[(42, (555,)), ,]$

$[(43, (555,)), ,]$



42  
*member*

43  
*member*

*group*  
555



*roles* describe the context in which things appear

$[\{(42, \textit{member}), (555, \textit{group})\}, ,]$

$[\{(43, \textit{member}), (555, \textit{group})\}, ,]$



42  
member

43  
member

group  
555



the combination of a unique identifier and a role is called an *appearance*

`[{(42, member), (555, group)},,]`

`[{(43, member), (555, group)},,]`



42  
*member*

43  
*member*

*group*  
555



a set of one or many appearances is called an *appearance set*

$[\{(42, \text{member}), (555, \text{group})\}, ,]$

$[\{(43, \text{member}), (555, \text{group})\}, ,]$



**42**  
*member*  
**participating**  
  
*group*  
**555**



**43**  
*member*  
**participating**

nothing appears without a *value*

```
[{(42, member), (555, group)}, participating,]  
[{(43, member), (555, group)}, participating,]
```



**42**  
*member*  
**participating**  
  
*group*  
**555**



**43**  
*member*  
**participating**  
  
  
**1962-06-17**

values are always bound to their *time of appearance* which provides an ordering

```
[{(42, member), (555, group)}, participating, 1962-06-17]  
[{(43, member), (555, group)}, participating, 1962-06-17]
```



values and timepoints  
may be of *complex* or *primitive* types  
and assumed sufficiently precise

traditional *attributes* are  
expressed using posits with  
one appearance

[{(42, *name*)}, **Arnold Palmer**, 1929-09-10]  
[{(43, *name*)}, **Jack Nicklaus**, 1940-01-21]  
[{(555, *name*)}, **Playoff Group**, 1962-06-16 19:45]

traditional *relationships* are  
expressed using posits with  
more than one appearance

[{(42, *member*), (555, *group*)}, **participating**, 1962-06-17]  
[{(43, *member*), (555, *group*)}, **participating**, 1962-06-17]

values in relationships are  
often enumerations representing  
the lifecycle



traditional *classification* is  
also expressed using posits

```
[{(4711, name)}, Professional Golfer, 1860]  
[{(42, has), (4711, class)}, classified, 1954]  
[{(43, has), (4711, class)}, classified, 1961]
```

multiple simultaneously  
valid classifications are  
possible to express

```
[{(4712, name)}, Player, 1860]  
[{(42, has), (4712, class)}, classified, 1962-06-14]  
[{(43, has), (4712, class)}, classified, 1962-06-14]
```

“Arnold and Jack are both professional golfers and sometimes players.”



introduce two new things  
that can have opinions

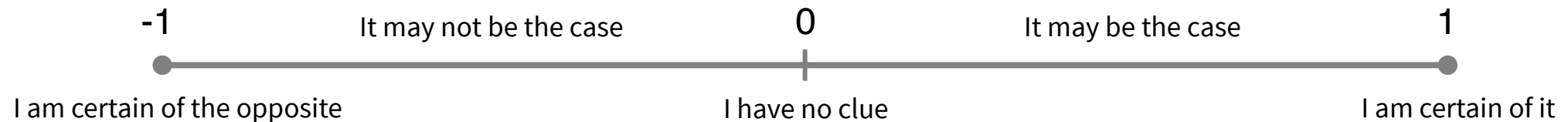
```
[{(44, name)}, Lars Samuelsson, 1972-08-20]  
[{(45, name)}, Göran Zachrisson, 1938-05-14]
```

giving posits their own  
unique identifiers makes it  
possible to "talk" about  
them, using meta-posits

```
[{(4712, name)}, Player, 1860]  
P112: [{(42, has), (4712, class)}, classified, 1962-06-14]  
P113: [{(43, has), (4712, class)}, classified, 1962-06-14]
```

an *assertion* is a meta-posit  
that assigns a *confidence*  
level in the range  $[-1, 1]$  to  
an existing posit, along  
with who or what is  
holding that opinion

```
[{(P112, posit), (44, asserter)}, 0.9, 2019-10-15]  
[{(P112, posit), (45, asserter)}, -1, 2019-10-15]  
[{(P113, posit), (44, asserter)}, 1, 2019-10-15]  
[{(P113, posit), (45, asserter)}, 0, 2019-10-15]
```





a *change* happens when the same dereferencing set appears again with a different value and appearance time

[{(44, *name*)}, **Lars Samuelsson**, 1972-08-20]

[{(44, *name*)}, **Lars Rönnbäck**, 2004-06-19]

[{(42, *member*), (555, *group*)}, **participating**, 1962-06-17]

[{(42, *member*), (555, *group*)}, **disbanded**, 1962-06-18]



a *correction* is a series of assertions with the same dereferencing set, where the latest confidence is 0

it may be followed by a new opinion for a posit having the same roles as the one being corrected

**P112:**  $[[\langle 4712, \textit{name} \rangle], \textit{Player}, 1860]$   
 $[[\langle 42, \textit{has} \rangle, \langle 4712, \textit{class} \rangle], \textit{classified}, 1962-06-14]$   
 $[[\langle \textit{P112}, \textit{posit} \rangle, \langle 44, \textit{asserter} \rangle], 0.9, 2019-10-15]$   
 $[[\langle \textit{P112}, \textit{posit} \rangle, \langle 44, \textit{asserter} \rangle], 0, 2019-10-17]$

**P114:**  $[[\langle 4713, \textit{name} \rangle], \textit{Golf player}, 1860]$   
 $[[\langle 42, \textit{has} \rangle, \langle 4713, \textit{class} \rangle], \textit{classified}, 1962-06-14]$   
 $[[\langle \textit{P114}, \textit{posit} \rangle, \langle 44, \textit{asserter} \rangle], 1, 2019-10-17]$



```
[{(4712, name)}, Player, 1860]  
[{(4713, name)}, Golf player, 1860]
```

relationships between  
classes can be expressed

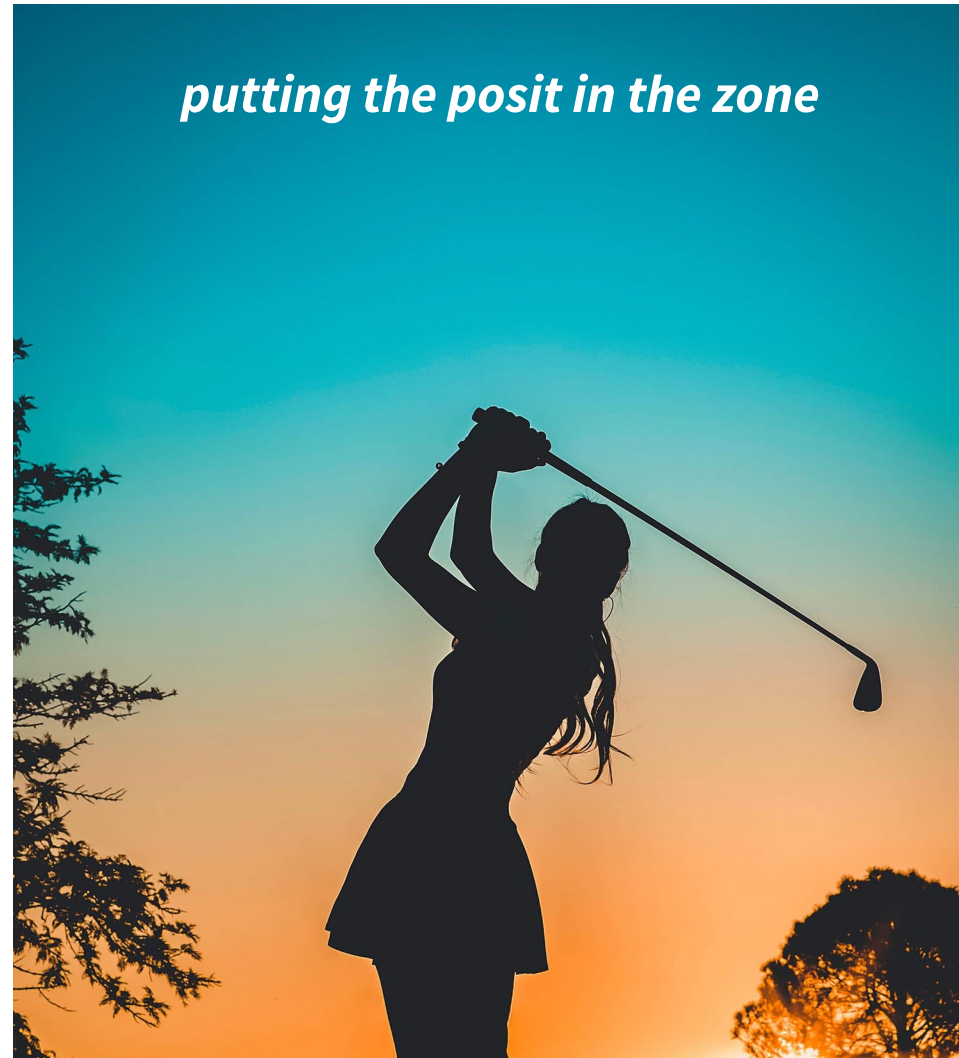
```
[{(4712, class), (4713, subclass)}, active, 2019-10-17]
```

```
[{(4711, name)}, Professional Golfer, 1860]  
[{(4714, name)}, Amateur Golfer, 1502]
```

```
[{(4714, class), (4711, progressed class)}, active, 2019-10-17]
```




# a transitional round of golf






a *scorecard* is a sort of portable database that keeps track of how your golf round is progressing



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
PAR	5	3	4	4	4	4	4	3	5	5	3	4	4	4	4	4	3	5
Palmer																		
Nicklaus																		



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
PAR	5	3	4	4	4	4	4	3	5	5	3	4	4	4	4	4	3	5
Nicklaus																		
Palmer																		

players have their own scorecard but also act as a marker, keeping the score of their fellow player



	<i>played</i>	<i>score</i>
Jack Nicklaus	<b>13</b>	<b>-1</b>
Arnold Palmer	<b>13</b>	<b>-1</b>
Bobby Nichols	<b>14</b>	<b>E</b>
Phil Rodgers	<b>15</b>	<b>1</b>
Gay Brewer	<b>14</b>	<b>2</b>
Tommy Jacobs	<b>16</b>	<b>2</b>
Gary Player	<b>16</b>	<b>3</b>

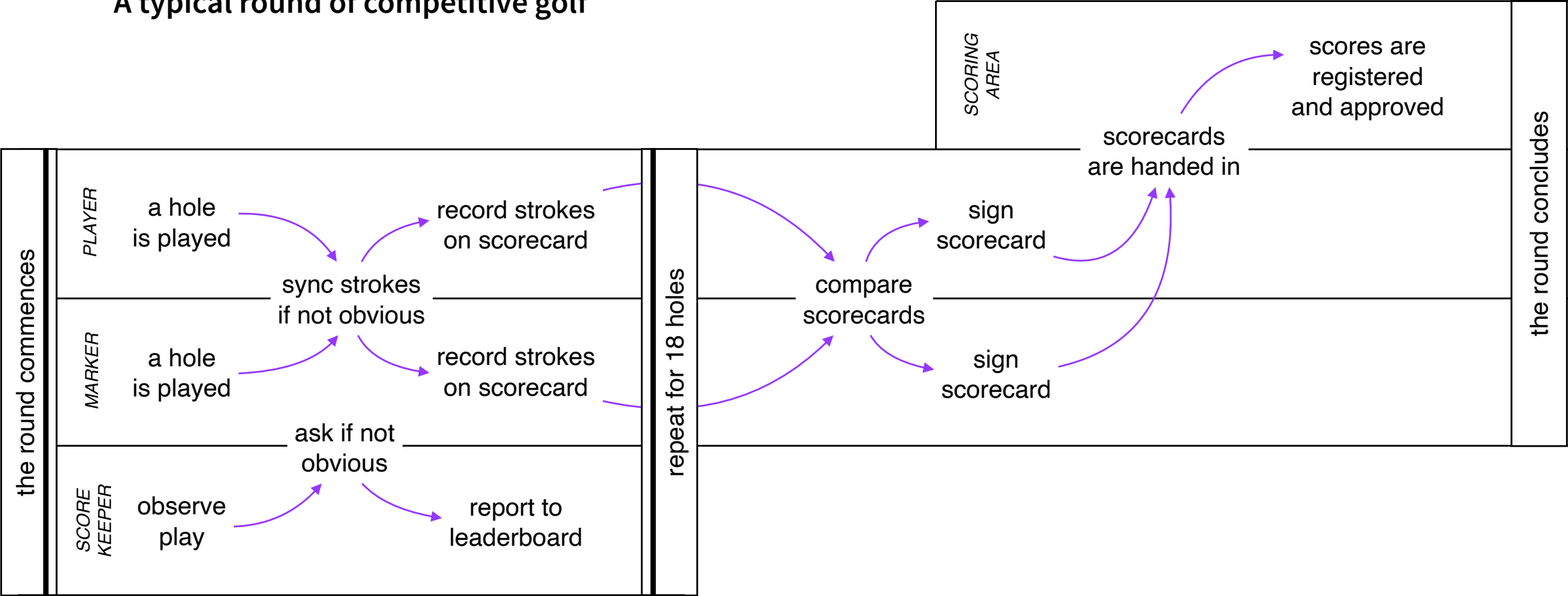
the *score* is measured after each played hole

score = cumulative number of strokes - sum of pars

a *leaderboard* shows the scores of players as the game progresses and is updated when players move between holes




A typical round of competitive golf




*How many truths are out there?*

Scorecards and leaderboard after hole 1

PLAYER		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	PAR	5	3	4	4	4	4	4	3	5	5	3	4	4	4	4	4	3	5
	Palmer	5																	
	Nicklaus	4																	

MARKER		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	PAR	5	3	4	4	4	4	4	3	5	5	3	4	4	4	4	4	3	5
	Nicklaus	4																	
	Palmer	5																	

Jack Nicklaus made a birdie on the first

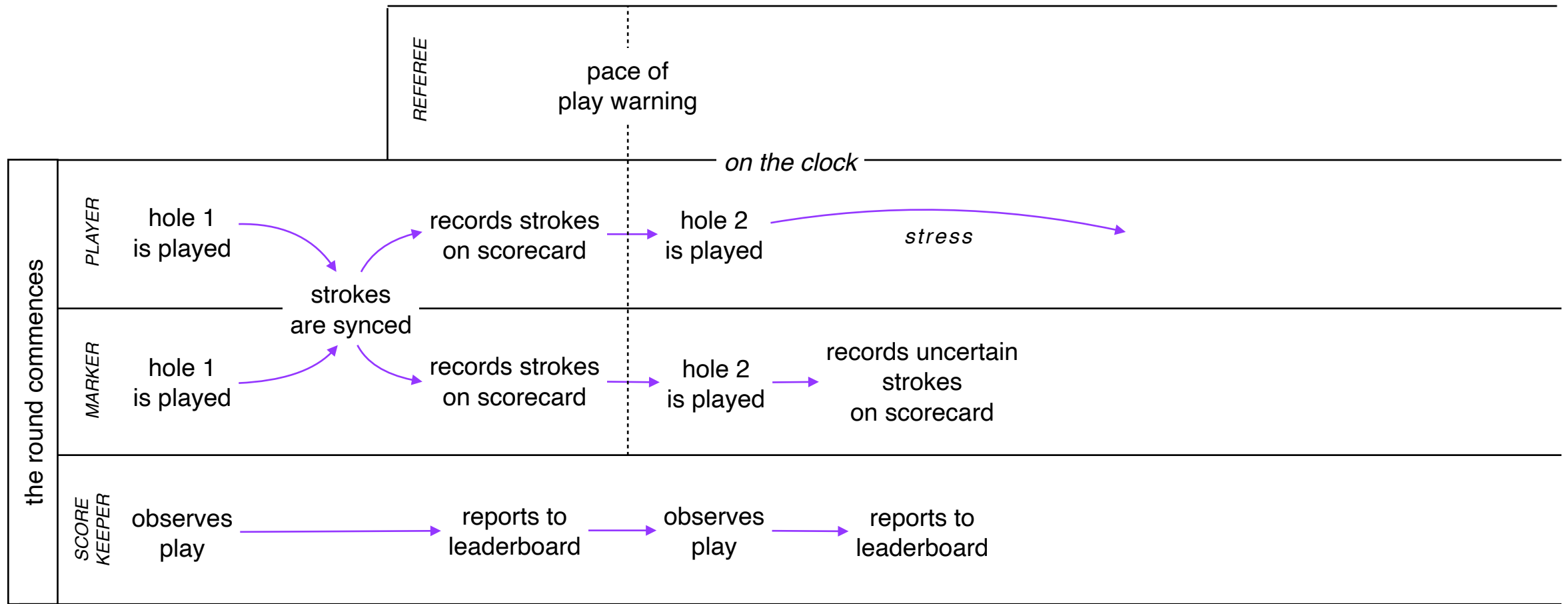
	<i>played</i>	<i>score</i>
Jack Nicklaus	1	-1
Arnold Palmer	1	E



**P1:** [{{(1962, name)}, US Open, 1962}]  
**N1:** [{{(1962, competition), (42, participant), (1, hole)}, 5, 1962-06-14 08:15}]  
**N1:** [{{(1962, competition), (43, participant), (1, hole)}, 4, 1962-06-14 08:15}]

[{{(47, name)}, Mr. Scorekeeper, 1931-01-01}]  
[{{(P1, posit), (42,asserter)}, 1, 1962-06-14 08:15}]  
[{{(N1, posit), (42,asserter)}, 1, 1962-06-14 08:15}]  
[{{(P1, posit), (43,asserter)}, 1, 1962-06-14 08:15}]  
[{{(N1, posit), (43,asserter)}, 1, 1962-06-14 08:15}]  
[{{(P1, posit), (47,asserter)}, 1, 1962-06-14 08:16}]  
[{{(N1, posit), (47,asserter)}, 1, 1962-06-14 08:16}]


[{{(1962, competition), (42, participant)}, E, 1962-06-14 08:16}]  
[{{(1962, competition), (43, participant)}, -1, 1962-06-14 08:16}]




*Real life doesn't always follow process!*



Scorecards and leaderboard after hole 2

PLAYER		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	PAR	5	3	4	4	4	4	4	3	5	5	3	4	4	4	4	4	3	5
	Palmer	5																	
	Nicklaus	4																	

MARKER		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	PAR	5	3	4	4	4	4	4	3	5	5	3	4	4	4	4	4	3	5
	Nicklaus	4	3																
	Palmer	5	3																

the leaderboard is showing the opinion of the scorekeeper, rather than that of Arnold Palmer

	played	score
Jack Nicklaus	2	-1
Arnold Palmer	2	E

**P2:** [[{(1962, competition),(42, participant),(2, hole)}, 3, 1962-06-14 08:30]

**N2:** [[{(1962, competition),(43, participant),(2, hole)}, 3, 1962-06-14 08:30]

[[{(P2, posit),(43,asserter)}, 0.8, 1962-06-14 08:30]

[[{(N2, posit),(43,asserter)}, 0.8, 1962-06-14 08:30]

[[{(P2, posit),(47,asserter)}, 0.7, 1962-06-14 08:31]

[[{(N2, posit),(47,asserter)}, 0.7, 1962-06-14 08:31]

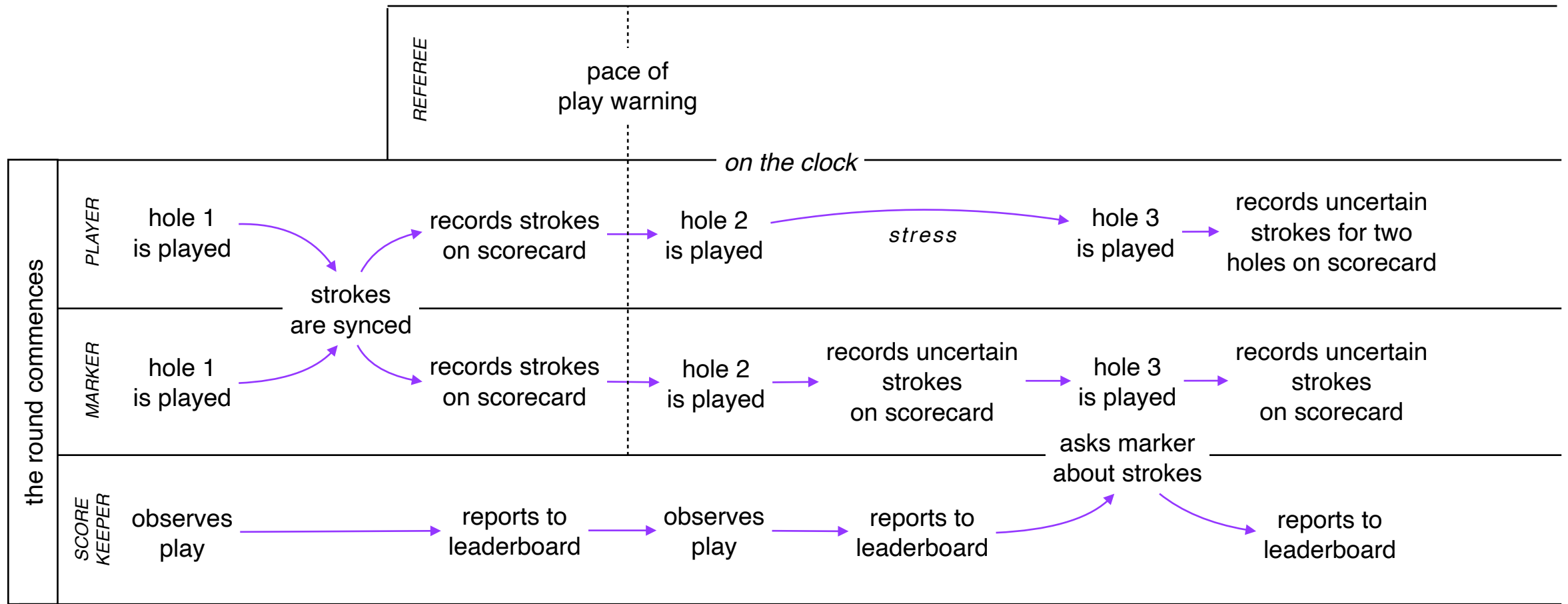
the score keeper (47) did  
not have time to ask about  
the scores, so is therefore  
even less certain (0.7)

[[{(1962, competition),(42, participant)}, E, 1962-06-14 08:31]

[[{(1962, competition),(43, participant)}, -1, 1962-06-14 08:31]


Arnold Palmer (42) is not asserting any  
strokes for hole 2 at this moment






Who has the best information?

Scorecards and leaderboard after hole 3

PLAYER		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	PAR	5	3	4	4	4	4	4	3	5	5	3	4	4	4	4	4	3	5
	Palmer	5	3	4															
	Nicklaus	4	4	4															

MARKER		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	PAR	5	3	4	4	4	4	4	3	5	5	3	4	4	4	4	4	3	5
	Nicklaus	4	3	4															
	Palmer	5	3	4															

the leaderboard is unaware of the fact that there is a difference of opinion concerning hole 2

	played	score
Jack Nicklaus	3	-1
Arnold Palmer	3	E



**P2:** [[(1962, competition),(42, participant),(2, hole)], 3, 1962-06-14 08:30]  
**N2:** [[(1962, competition),(43, participant),(2, hole)], 3, 1962-06-14 08:30]  
**N2B:** [[(1962, competition),(43, participant),(2, hole)], 4, 1962-06-14 08:30]  
**P3:** [[(1962, competition),(42, participant),(3, hole)], 4, 1962-06-14 08:45]  
**N3:** [[(1962, competition),(43, participant),(3, hole)], 4, 1962-06-14 08:45]

[(P2, posit),(42,asserter)], 0.8, 1962-06-14 08:45]  
 [(N2B, posit),(42,asserter)], 0.6, 1962-06-14 08:45]  
 [(P3, posit),(42,asserter)], 0.8, 1962-06-14 08:45]  
 [(N3, posit),(42,asserter)], 0.8, 1962-06-14 08:45]  
 [(P3, posit),(43,asserter)], 0.8, 1962-06-14 08:45]  
 [(N3, posit),(43,asserter)], 0.8, 1962-06-14 08:45]  
 [(P2, posit),(47,asserter)], 1, 1962-06-14 08:46]  
 [(N2, posit),(47,asserter)], 1, 1962-06-14 08:46]  
 [(P3, posit),(47,asserter)], 1, 1962-06-14 08:46]  
 [(N3, posit),(47,asserter)], 1, 1962-06-14 08:46]

Arnold Palmer (42) asserts  
 posits for both hole 2 and  
 hole 3, but has a conflicting  
 opinion about hole 2

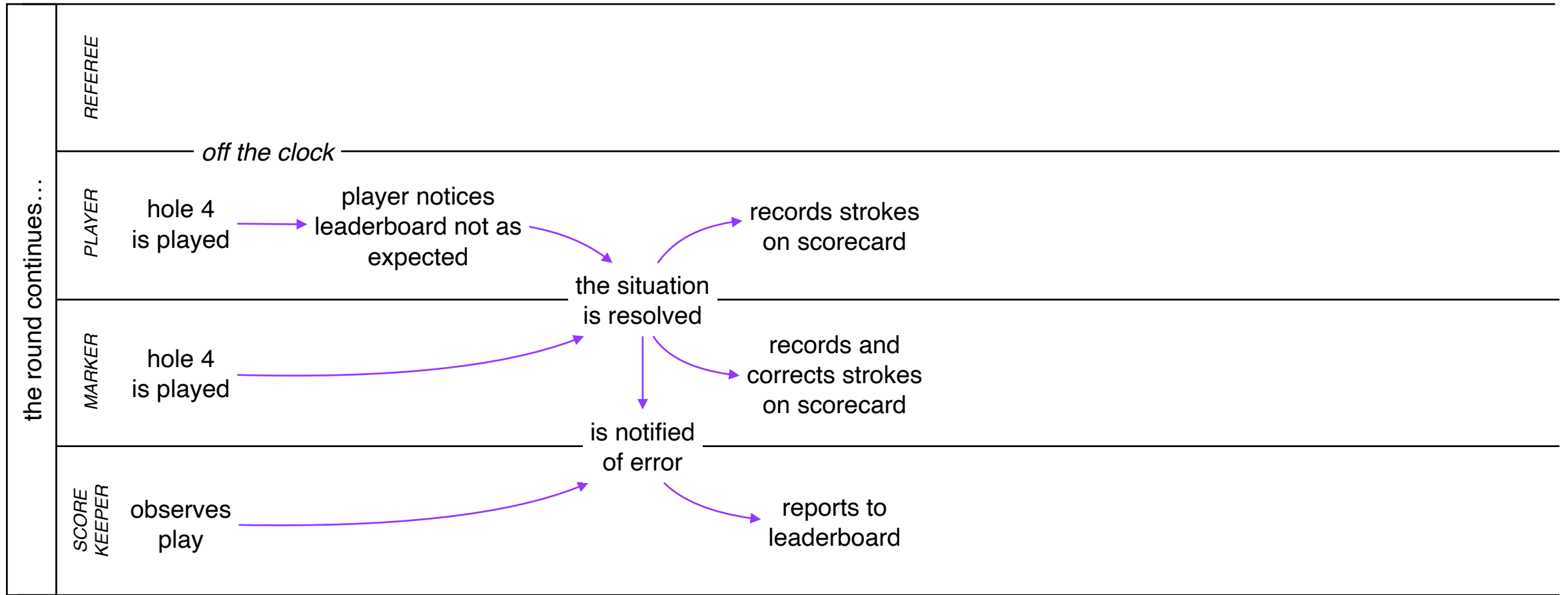
the score keeper (47) reasserts  
 the number of strokes on hole 2  
 with more certainty after  
 talking to the marker

### All leaderboard posits up to and including hole 3

LP1: [ {(1962, competition), (42, participant)}, E, 1962-06-14 08:16 ]  
LP2: [ {(1962, competition), (42, participant)}, E, 1962-06-14 08:31 ]  
LP3: [ {(1962, competition), (42, participant)}, E, 1962-06-14 08:46 ]  
  
LN1: [ {(1962, competition), (43, participant)}, -1, 1962-06-14 08:16 ]  
LN2: [ {(1962, competition), (43, participant)}, -1, 1962-06-14 08:31 ]  
LN3: [ {(1962, competition), (43, participant)}, -1, 1962-06-14 08:46 ]


the leaderboard has possible redundancy among its posits, so called *restatements*, unless it is important to keep track of the fact that a value remains the same or if posits may arrive out of temporal order






*A consensus is reached!*

Scorecards and leaderboard after hole 4

PLAYER		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	PAR	5	3	4	4	4	4	4	3	5	5	3	4	4	4	4	4	3	5
	Palmer	5	3	4	4														
	Nicklaus	4	4	4	4														

MARKER		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	PAR	5	3	4	4	4	4	4	3	5	5	3	4	4	4	4	4	3	5
	Nicklaus	4	<del>3</del> 4	4	4														
	Palmer	5	3	4	4														

the leaderboard is corrected, given the new knowledge of the number of strokes on hole 2

	<i>played</i>	<i>score</i>
Jack Nicklaus	4	E
Arnold Palmer	4	E



**P2:** [[(1962, competition),(42, participant),(2, hole)], 3, 1962-06-14 08:30]  
**N2:** [[(1962, competition),(43, participant),(2, hole)], 3, 1962-06-14 08:30]  
**N2B:** [[(1962, competition),(43, participant),(2, hole)], 4, 1962-06-14 08:30]

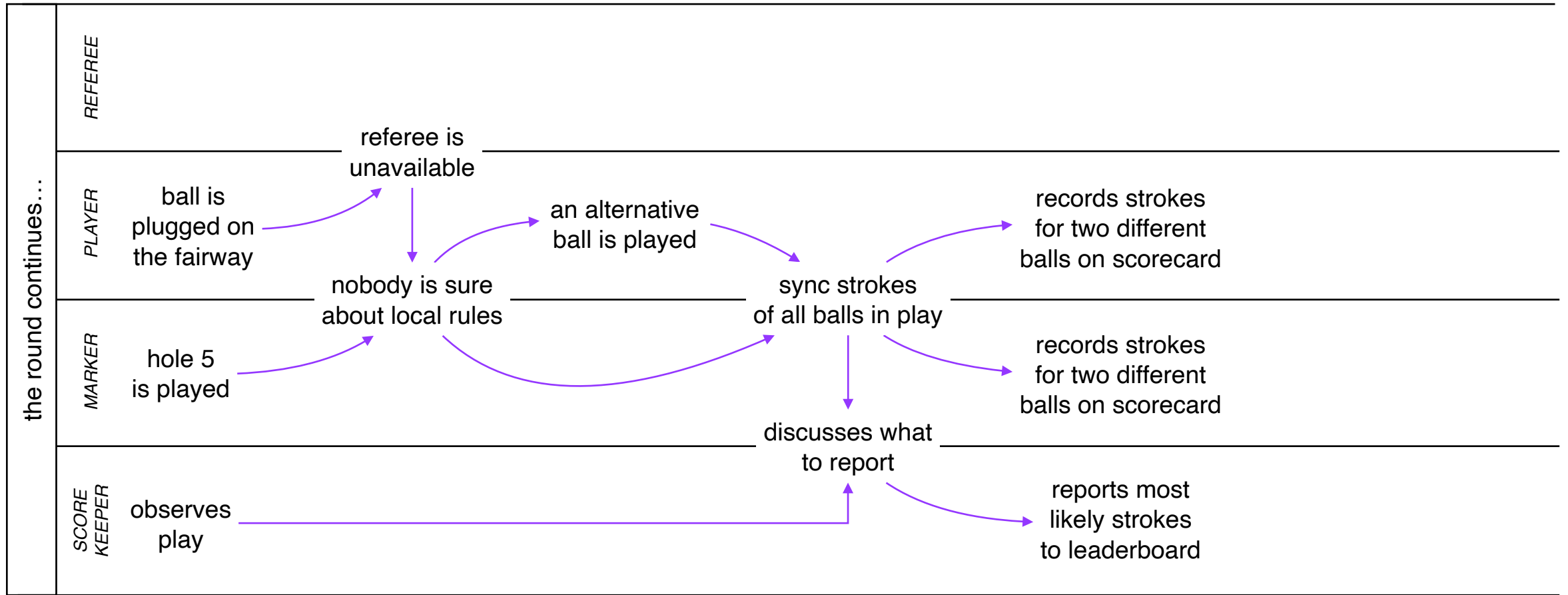
[(P2, posit),(43,asserter)], 0, 1962-06-14 09:00]  
[(N2B, posit),(43,asserter)], 1, 1962-06-14 09:00]

Jack Nicklaus (43) corrects  
the number of strokes by  
retracting and asserting anew.

**LN1:** [[(1962, competition),(43, participant)], -1, 1962-06-14 08:16]  
**LN2:** [[(1962, competition),(43, participant)], -1, 1962-06-14 08:31]  
**LN3:** [[(1962, competition),(43, participant)], -1, 1962-06-14 08:46]  
**LN2c:** [[(1962, competition),(43, participant)], E, 1962-06-14 08:31]  
**LN3c:** [[(1962, competition),(43, participant)], E, 1962-06-14 08:46]


[(LN2, posit),(47,asserter)], 0, 1962-06-14 09:00]  
[(LN3, posit),(47,asserter)], 0, 1962-06-14 09:00]  
[(LN2c, posit),(47,asserter)], 1, 1962-06-14 09:00]  
[(LN3c, posit),(47,asserter)], 2, 1962-06-14 09:00]


the score keeper (47) retracts his  
opinion of two posits and asserts  
new and corrected posits.



*Multiple truths are in play!*

Scorecards and leaderboard after hole 5

PLAYER		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	PAR	5	3	4	4	4	4	4	3	5	5	3	4	4	4	4	4	3	5
	Palmer	5	3	4	4	4?5													
	Nicklaus	4	4	4	4	4													

MARKER		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	PAR	5	3	4	4	4	4	4	3	5	5	3	4	4	4	4	4	3	5
	Nicklaus	4	<del>3</del> 4	4	4	4													
	Palmer	5	3	4	4	4?5													

the leaderboard can only show one score and cannot take alternative balls into account

	<i>played</i>	<i>score</i>
Jack Nicklaus	4	E
Arnold Palmer	4	+1



**P5a:** [[(1962, competition),(42, participant),(5, hole)], 4, 1962-06-14 09:15]  
**P5b:** [[(1962, competition),(42, participant),(5, hole)], 5, 1962-06-14 09:15]  
**N5:** [[(1962, competition),(43, participant),(5, hole)], 4, 1962-06-14 09:15]

[(P5a, posit),(42,asserter)], 0.3, 1962-06-14 09:00]  
[(P5b, posit),(42,asserter)], 0.7, 1962-06-14 09:00]  
[(P5a, posit),(43,asserter)], 0.3, 1962-06-14 09:00]  
[(P5b, posit),(43,asserter)], 0.7, 1962-06-14 09:00]  
[(N5, posit),(42,asserter)], 0, 1962-06-14 09:00]  
[(N5, posit),(43,asserter)], 1, 1962-06-14 09:00]

Two alternative realities are in play and one is more probable than the other.

**LP5:** [[(1962, competition),(43, participant)], +1, 1962-06-14 09:16]  
**LN5:** [[(1962, competition),(43, participant)], E, 1962-06-14 09:16]

[(LN5, posit),(47,asserter)], 0, 1962-06-14 09:16]  
[(LP5, posit),(47,asserter)], 0.7, 1962-06-14 09:16]

the score keeper (47) reports the most likely score to show on the leaderboard.