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**Edited by  
Matt Pearson**

  
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Cover photo of the AFLA 24 conference icon.

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## INTRODUCTION FROM THE VOLUME EDITOR

The Austronesian Formal Linguistics Association (AFLA) is an informal organization of linguists which promotes the study of Austronesian languages from a formal perspective, including both experimental and fieldwork-based methodologies. AFLA serves as a forum for the presentation of new research focusing on the phonetic, phonological, morphological, syntactic, semantic, typological, and psycholinguistic analysis of individual Austronesian languages, as well as work which compares the structure of Austronesian languages with each other and with languages outside the family. The first AFLA conference took place in 1994 at the University of Toronto, and was co-organized by Anna Maclachlan, Diane Massam, Richard McGinn, Barry Miller, and Lisa Travis. Annual meetings of AFLA have been held every year since 1994. More information about AFLA, including a list of prior conference programs and proceedings, can be found at [www.uwo.ca/linguistics/research/afla/index.html](http://www.uwo.ca/linguistics/research/afla/index.html).

The papers in this special publication of JSEALS were originally presented at the 24th annual meeting of AFLA, which was held at the University of Washington in Seattle on April 7-9, 2017. The conference was co-organized by faculty and students at the University of Washington Department of Linguistics and the Department of Linguistics at Reed College (Portland, Oregon), and included both a general session and a workshop on Comparative Formosan Linguistics. On behalf of the AFLA 24 organizing committee, I would like to thank the authors of these papers for their contributions, as well as the conference participants and volunteers, and the following organizations for their financial support: the Chiang Ching-kuo Foundation for International Scholarly Exchange, the University of Washington College of Arts and Sciences, and the University of Washington Department of Asian Languages and Literature, as well as the University of Washington's East Asia Center, Southeast Asia Center, and Taiwan Studies Initiative.

### **Editor**

Matt Pearson  
Reed College  
co-chair, AFLA 24 Organizing Committee  
chair, AFLA 24 Program Committee

## **FROM THE JSEALS EDITOR-IN-CHIEF**

This is the fourth JSEALS special publication. The goal of JSEALS special publications is to share collections of linguistics articles, such as select papers from conferences or other special research agendas, as well as to offer a way for linguistic researchers in the greater Southeast Asian region to publish monograph-length works.

This volume contains six papers from the AFLA 24 conference. The languages covered in this volume are spoken in Taiwan, Indonesia, Oceania and Madagascar. This vast extension on “Greater Southeast Asia” is the case because, though Austronesian has an insular Southeast Asian presence and origins, it has famously extended quite far through Austronesian seafaring skill, making it necessary to include languages in this tremendous geographic range. Five of the papers are on issues of semantico-syntactic issues, with one on phonology, making this a substantive contribution to theoretical linguistics in general.

We are very pleased that JSEALS is able to contribute to the sharing of quality linguistic research in both mainland and insular Southeast Asia.

**Mark J. Alves**

December 1<sup>st</sup>, 2019

Montgomery College

Rockville, Maryland

# THE TEMPORAL INTERPRETATION OF COMPLEMENT AND RELATIVE CLAUSES: CONTRASTING ENGLISH AND SAMOAN

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## Abstract

Based on data from original fieldwork, this paper investigates the temporal interpretation of two subordinate constructions in Samoan, an aspect-prominent language. We show that both relative and complement clauses are interpreted as temporally dependent on the matrix sentence. Embedding a past perfective under a past perfective always yields a backward shifted interpretation, while embedding an imperfective yields a simultaneous interpretation. We derive this pattern by positing lambda abstraction over a temporal proform in the embedded constituent, which in the case of the past perfective is its presupposition.

**Keywords:** Semantics, tense, aspect, subordination, presupposition binding

**ISO 639-3 codes:** smo, eng, jpn

## 1 Introduction and background

### *1.1 The temporal interpretation of subordinate constructions*

The temporal interpretation of subordinate constructions across languages is a very active area of research in semantics (see, e.g., Kusumoto 1999, Hataw 2012, and Ogihara and Sharvit 2012 for overviews and further references) and is generally considered a touchstone for the adequacy of any theory of tense and aspect (von Stechow 2009). So far, however, the majority of the research on the topic has focused on languages like English, which morphologically encode tense (but see Mucha 2015; Bochnak 2016; Mucha and Fominyam 2017). In this paper, we offer an overview of the temporal interpretation of two types of subordinate constructions in Samoan, an aspect-prominent Polynesian language, together with a compositional semantic analysis. The interpretative pattern that we find is uniform across constructions: Simultaneous readings require an embedded imperfective aspect, while backward shifted readings only arise with the embedded past perfective. We derive this pattern by lambda abstraction over a temporal proform in the embedded constituent.

The structure of the paper is as follows: The next subsection provides a concise introduction to the temporal interpretation of relative and complement clauses in English, along with a standard analysis. Against this background, section 2 provides the view from Samoan: Subsection 2.1 sets up the basic architecture of tense and aspect in the language. Subsection 2.2 discusses the interpretative possibilities of complement and relative clauses. These data are then analysed in section 3. Section 4 concludes with a discussion of the structural and lexical differences between English and Samoan that lead to the observed variation, and with some remarks regarding the broader cross-linguistic picture.

### *1.2 The view from English*

In English, a past tense embedded under a past tense in a complement clause like (1) may have two readings, a backward shifted and a simultaneous reading. Under the same configuration, relative clauses also allow for those two types of readings, as shown in (2). They do however additionally license a forward-shifted interpretation, illustrated in (3). We are thus confronted with “. . . the puzzling fact that most, but not all, occurrences of past tense convey a meaning of anteriority” (Heim 1994, p. 143).

- (1) *Susan said [that Mary was pregnant].*  
 Susan said: ‘Mary was pregnant.’ (BACKWARD SHIFTED, BACKWARD)  
 Susan said: ‘Mary is pregnant.’ (SIMULTANEOUS, SIM)
- (2) *Susan talked to a boy [who was crying].*  
 ‘The running time of the boy crying precedes the running time of Susan talking to him.’ (BACKWARD)  
 ‘The running time of the event of Susan talking to the boy overlaps with his crying.’ (SIM)
- (3a) *Hillary married a man [who became President of the United States].*  
 ‘Hillary’s marriage pre-dates her husband’s inauguration.’ (LATER-THAN-MATRIX, LATER)  
 (Kusumoto 1999, p. 14, no. (12a))
- (3b) *Who hired the person [who wrote this article]?*  
 ‘The girl was hired before the time of writing.’ (LATER)  
 (Kusumoto 1999, p. 14, no. (12b))

Note that the availability of these readings in English interacts with eventuality type: In complement clauses, embedded stative predicates generally allow for simultaneous readings. For eventive predicates, however, the simultaneous interpretation is easily available only with the progressive, as is illustrated in (4). This observation goes back to Enç (1987) and Ogihara (1989).

- (4a) *Susan said [that Peter was crying].* (BACKWARD, SIM)  
 (4b) *Susan said [that Peter cried].* (BACKWARD only)

Kusumoto (1999, pp. 78-80) provides the counterexample in (5), attributed to Barbara Partee, which readily allows for the simultaneous interpretation. Relative clauses appear not to be subject to these restrictions, as is evident from the examples in (3) above.

- (5) (I thought the glass fell by itself.) *I didn’t know [that you pushed it].*

While we will not pursue an analysis of the interaction between eventuality type and the availability of the different interpretations in English here, these observations serve as a reminder to be aware of the eventuality type of the embedded predicate when investigating the temporal interpretation of subordinate constructions.

How can we account for these different readings then? Under structural approaches (Ogihara 1989, 1995, 1996; Abusch 1997; Kratzer 1998; Kusumoto 1999, 2005; Stowell 2007; von Stechow 2009; Grønn and von Stechow 2010), the different readings of past-under-past in attitude complements derive from two distinct Logical Forms.<sup>1</sup> (The readings available for past-under-past in relative clauses, however, do not, as we will see in a moment.) I present below an implementation of such a structural approach for which I adopt a quantificational analysis of tense (but see Partee 1973 and Kratzer 1998), in addition to a standard analysis of aspectual meaning (e.g., Krifka 1989, Klein 1994, Kratzer 1998). For reasons of simplicity, we assume here that the English progressive encodes the imperfective (but see, e.g., Dowty 1977, 1979, and refinements thereof).

A simple matrix sentence like (6) will then, somewhat informally, require that there is a contextually salient time before the utterance time (= the contribution of past tense) at which Peter was crying. The running time of the crying event must include this reference time (= the contribution of the imperfective aspect). The denotations of the temporal and aspectual operators that derive this interpretation are in (7). The Logical Form for the sentence is in (8); we assume that the utterance time is syntactically represented in the topmost layer of the clause.

<sup>1</sup> Altshuler and Schwarzschild (2013) and Altshuler (2016) question in how far SIM and BACKWARD are really truth-conditionally distinct readings that derive from two LFs, and propose a pragmatic approach to sequence of tense.



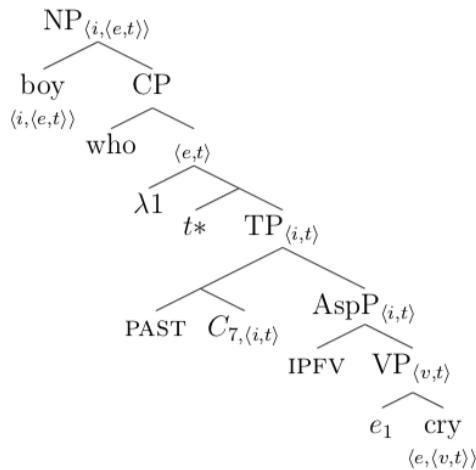


- (13) Past-under-Past Deletion Rule:  
 A past tense operator  $\alpha$  may be deleted if and only if  
 $\alpha$  is locally  $c$ -commanded by another past tense operator  $\beta$ .

Under a somewhat refined view of the syntax-morphology interface (where the past morphology that we see on the verb is distinct from the PAST-operator that sits in the LF structure), generating this LF structure can however also be thought of as the result of some licensing mechanism (Stowell 2007; Kusumoto 1999, 2005). In the case of the simultaneous reading, the PAST-operator upstairs licenses the tense morphology both on the matrix verb and on the embedded verb. Kratzer (1998) suggests thinking of this relationship in terms of agreement.

Whatever the technical implementation, this mechanism must not apply in relative clauses. I follow Kusumoto (1999, 2005)’s analysis here, under which the three different temporal readings that relative clauses allow for (i.e., the backward shifted, the simultaneous, and the later-than-matrix interpretation) are a result of under-specification. More specifically, unlike in complement clauses, the tense variable that the embedded PAST-operator combines with is stipulated to be the utterance time, which is syntactically represented in the CP-layer of the clause, as in (14a).<sup>2</sup> The noun phrase then receives the interpretation in (14b), which requires that the run time of the crying event be contained with a time which is prior to the utterance time.

- (14a) Logical Form for relative clause:



- (14b)  $\llbracket \text{NP} \rrbracket = \lambda t. \lambda x. x \text{ is a boy at } t \ \& \ \exists t' [C(t') = 1 \ \& \ t' < t^* \ \& \ \exists e [\tau(e) \supset t' \ \& \ e \text{ is an event of } x \text{ crying}]]$

The truth conditions we derive for the sentence are in (15). Both the matrix and the embedded past are interpreted relative to the utterance time  $t^*$ . The truth conditions do thus however not specify an ordering between the matrix reference times  $t''$  and the relative clause reference time  $t'$ .

- (15) Truth conditions for past-under-past in relative clauses:  
 $\llbracket (2) \rrbracket = 1$  iff  $\exists t'' [C'(t'') = 1 \ \& \ t'' < t^* \ \& \ \exists x [x \text{ is a boy at } t'' \ \& \ \exists t' [C(t') = 1 \ \& \ t' < t^* \ \& \ \exists e [\tau(e) \supset t' \ \& \ e \text{ is an event of } x \text{ crying}]] \ \& \ \exists e' [\tau(e') \supset t'' \ \& \ e' \text{ is an event of Mary talking to } x]]]$  (independent)

Under this analysis for English, relative clauses are thus temporally independent of their matrix clause. As a result, all three temporal readings are possible (BACKWARD, SIM, LATER).

To sum up this concise introduction to the temporal interpretation of past-under-past in complement and relative clauses in English: In complement clauses, this configuration allows for SIM and BACKWARD. (Certain

<sup>2</sup> Here, the noun combines with the relative clause via Extended Predicate Modification #1: If  $\alpha$  is a branching node and  $\beta$  and  $\gamma$  its daughters,  $\llbracket \beta \rrbracket \in D_{\langle i, \langle e, t \rangle \rangle}$  and  $\llbracket \gamma \rrbracket \in D_{\langle e, t \rangle}$ , then  $\llbracket \alpha \rrbracket = \lambda t. \lambda x. \llbracket \beta \rrbracket(t)(x) = 1 \ \& \ \llbracket \gamma \rrbracket(x) = 1$ .

restrictions pertaining to eventuality type apply.) In relative clauses, this configuration additionally may license LATER-THAN-MATRIX. This pattern is summarized in Table 1.

**Table 1:** *The temporal interpretation of past-under-past in complement and relative clauses in English*

	complement clauses	relative clauses
SIMULTANEOUS	✓	✓
BACKWARD SHIFTED	✓	✓
LATER-THAN-MATRIX	#	✓

While the available readings are the result of a structural ambiguity under attitude complements, they arise from under-specification in the case of relative clauses, which—by means of an utterance time variable in the relative clause—is analysed as temporally independent of the superordinate structure. Temporally dependent readings are thus restricted to complement clauses (that is, to intensional contexts), a core hypothesis of Kusumoto (1999). So, how does Samoan compare to English when it comes to the temporal interpretation of these constructions and the composition behind them?

## 2 The view from Samoan

### 2.1 Background

Samoan is a Polynesian language with approximately 300,000 speakers worldwide, the majority of whom live on the Pacific islands that constitute American Samoa and the Independent State of Samoa.<sup>3</sup> Basic word order is VSO. Tense and aspect are encoded in pre-verbal free functional morphemes (see also Marsack 1975, Hunkin 1992, Mosel and Hovdhaugen 1992, Mosel 2000, Hohaus 2017). In a restricted number of environments, these markers are optional (see Mosel and Hovdhaugen 1992, pp. 371-374). Apart from generic *e*, prospective *'o le 'ā* and inchoative *'ua*, the inventory of temporal-aspectual markers (TAM) comprises the past perfective *na* and *sā*<sup>4</sup>, and the imperfective *'o lo 'o*. The evaluation time of an imperfective may be in the present, the past or the future, as shown in (16)–(18). (In this respect, the imperfective patterns with the inchoative; see Hohaus 2017 for the data and an analysis.) Out of the blue, however, the imperfective will always be evaluated with respect to the utterance time; past and future readings are marked, but appear to be possible.

(16) Imperfective/ utterance time as evaluation time:

(16a) Your friend Malia tells you the latest news about your friend Sina:

(16b) *'O lo 'o tō Sina*  
 TAM(ipfv) pregnant Sina  
 ‘Sina is pregnant.’

(16c) What is Ioane currently doing?

(16d) *'O lo 'o siva Ioane*  
 TAM(ipfv) dance John  
 ‘John is dancing.’

<sup>3</sup> Unless otherwise indicated, all data come from work with Samoan native speakers conducted in Germany, Hawai‘i and Samoa over the past ten years. Elicitation material was designed following Matthewson (2004) and Matthewson (2011). The original orthography of the examples has been preserved, resulting in some variation in the use of diacritics, e.g., *sā* versus *sa* for the past perfective.

<sup>4</sup> “There are two particles for the past [which we analyse as past perfective here], *sā* and *na*, which are more or less interchangeable, but *na* is preferred for events that happened unexpectedly and had a short duration.” (Mosel and So‘o 1997, p. 21).

(17) Imperfective/ evaluation time prior to utterance time:

(17a) Esa has a job as a receptionist at the Samoan Outrigger hotel. Yesterday, her shift was from 11:00pm to 6:00am. A taxi arrived at 11:30pm.

(17b) *'O lo'o faigaluega pea Esa ae taunu'u mai loa isi malo*  
 TAM(ipfv) work still Esa but arrive DIR then other guest  
 'Esa was still working when the other guests arrived.'

(18) Imperfective/ utterance time prior to evaluation time:

(18a) This is a drawing<sup>5</sup> of a *fiafia* night that one of the hotels has planned for Wednesday night. Here's what they have in mind for tomorrow:



(18b) *'O lo'o sisiva teine ma tama i le fa'afiafiaga taeao*  
 TAM(ipfv) dance(pl) girl and boy PREP the entertainment tomorrow  
 'The girls and boys are dancing at tomorrow's entertainment show.'

Perfective-marked predicates, however, are restricted in their interpretation. The examples in (19) must be interpreted with a past evaluation time. The sentence in (19a) is thus only acceptable if, in the words of one speaker, "Sina had a baby; she already gave birth". If context forces the evaluation time to follow the utterance time (that is, a future interpretation), as in (20), the use of the past perfective is unacceptable.

(19) Imperfective/ utterance time as evaluation time:

(19a) *Sā tō Sina*  
 TAM(past.pfv) pregnant Sina  
 'Sina was pregnant.'

(19b) *Sā siva le teine*  
 TAM(past.pfv) dance the girl  
 'The girl danced.'

(20a) Epe is sewing a new dress for her sister. She still has some work left to do when I visit her. She tells me to come back tomorrow, when she has more time. Here's the reason:

(20b) *#Sau taeao, sā uma ai le ofu lea*  
 come tomorrow TAM(past.pfv) whole PRN the dress DEM(sg)  
 'Come tomorrow, the dress will be done.'

<sup>5</sup> Illustration by Zahra Kolagar.

Despite this restriction to past reference times, the marker cannot be plausibly analysed as a past tense: It cannot combine with the imperfective to yield a past imperfective, as shown in (21), even though Samoan syntactically allows TAM-stacking in the case of the inchoative and the imperfective (see Hohaus 2017).

- (21) \**Sā*                      ‘o lo ‘o        siva    le    teine  
       TAM(past.pfv)    TAM(ipfv)    dance    the    girl  
       (Intended) ‘The girl was dancing.’

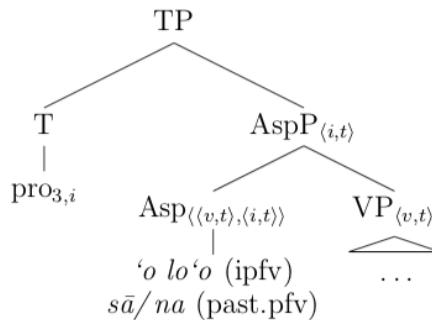
Neither can *sā* and *na* be used for ongoing events in the past: The unacceptability of (22) in the context described illustrates that the use of the marker requires the event to be contained in the reference time. One speaker comments, “Then she already bought a coconut.”

- (22a) Drawing of Tupe yesterday at a roadside stall that was selling coconuts for three tala each, showing her in the process of picking up a coconut:

- (22b) #*Sa*                      faatau    e        Tupe    i        le        niu  
       TAM(past.pfv)    buy        ERG    Tupe    PREP    the     coconut  
       (Intended) ‘Tupe was in the process of buying a coconut.’

Building on these observations, we suggest that the imperfective and the past perfective are aspectual operators, which at Logical Form combine with a morphologically null, free temporal variable in T, which receives its interpretation from the utterance context, as in (23).

- (23) The LF architecture of tense and aspect in Samoan:



While we assume a standard lexical entry for the Samoan imperfective, in (24a), we suggest that the perfective not only relates the running time of the event to the reference time, but also introduces a relational presupposition on its first argument, as in (24b): The evaluation time is required to be in the past. The operator thus fuses aspectual meaning with temporal meaning. Foreshadowing the analysis required for the embedded case, this evaluation time *t* is required to be past relative to some other time *t'*, rather than just the utterance time.

- (24a)  $\llbracket \text{'o lo 'o (ipfv)} \rrbracket = \lambda p_{\langle v, t \rangle}. \lambda t. \exists e [\tau(e) \supset t \ \& \ p(e) = 1]$   
 (24b)  $\llbracket s\bar{a} \text{ (past.pfv)} \rrbracket = \lambda t'. \lambda p_{\langle v, t \rangle}. \lambda t : t < t'. \exists e [\tau(e) \subseteq t \ \& \ p(e) = 1]$

Let’s apply this analysis to a minimal pair of examples: For the imperfective sentence in (16d), we derive the truth conditions in (25), namely that there is an event of John dancing whose running time includes a contextually provided time *t<sub>c</sub>*. By default, that time is going to be the utterance time, but as we have seen in (17) and (18) above, it can also be a time prior or preceding the time of utterance. This is an interesting finding of its own, especially in the light of data from other languages: While tenseless clauses in Washo (isolate; United States), an optional tense language, do not permit future interpretations (Bochnak 2016), they do in Medumba (Niger-Congo; Cameroon), which is a tenseless language (Mucha 2013).

(16d) ‘*O lo ‘o siva Ioane*  
 TAM(ipfv) dance John  
 ‘John is dancing.’

(25) Truth conditions for matrix imperfective:  
 $\llbracket (16d) \rrbracket = 1$  iff  $\exists e [\tau(e) \supset t_c \ \& \ e$  is an event of Ioane dancing in  $w_{@}$ ]

For the past perfective case in (19b), we derive (26). The sentence is only defined if context makes available an evaluation time  $t_c$  that precedes the utterance time. (The latter is a stipulation: In the matrix case, the past presupposition of the perfective has to be anchored to the utterance time.)

(19b) *Sā siva le teine*  
 TAM(past.pfv) dance the girl  
 ‘The girl danced.’

(26) Truth conditions for matrix past perfective:  
 $\llbracket (19b) \rrbracket = 1$  iff  $\exists e [\tau(e) \subseteq t_c \ \& \ e$  is an event of the girl dancing in  $w_{@}$ ]  
 $\llbracket (19b) \rrbracket$  is defined iff  $t_c < t^*$

We now have all the pieces of the analysis in place to be able to turn to the interpretation of complement and relative clauses. Crucially, under the analysis presented so far, Samoan is an aspect-prominent language. It is tenseless in the sense that, in the cases that we have discussed, there is no temporal operator in T, but just a free proform over times, which receives its interpretation from the utterance context.

We find that when embedded, this context dependency is replaced by a dependency on the evaluation time of the superordinate structure. We thus confirm an observation from the descriptive literature: “None of the Samoan TAM particles exclusively relates the reported event to the time of the speech event. ... In subordinate clauses such as relative and complement clauses, the point of reference is not the speech event, but the event reported by the main clause...” (Mosel and Hovdhaugen 1992, pp. 338-39)

## 2.2 The Data

### 2.2.1 Complement clauses

In Samoan, a past perfective embedded under a past perfective in a complement clause must receive a shifted reading, irrespective of the eventuality type encoded by the embedded predicate: The context in (27) is set up for a simultaneous reading, but the example sentence is unacceptable if the TAM in the complement clause is the past perfective. In the words of one speaker: “The sentence is still okay, but not with the story.” The desired simultaneous interpretation is however available with the imperfective in the complement clause.

(27a) You have not seen your friends Malia and Sina in a long time because they live in New Zealand now. Last week, however, you met Malia who is in Samoa visiting her family. She tells you: “Sina is expecting a baby!” You later tell your sister:

(27b) #*Sa ta ‘u mai e Malia [sā tō Sina]*  
 TAM(past.pfv) tell DIR ERG Mary TAM(past.pfv) pregnant Sina  
 ‘Mary told me that Sina was pregnant’ (SHIFT only)

(27c) *Sa ta ‘u mai e Malia [‘o lo ‘o tō Sina]*  
 TAM(past.pfv) tell DIR ERG Mary TAM(ipfv) pregnant Sina  
 ‘Mary told me that Sina was pregnant.’ (SIM only)

As in English, a past-perfect marked eventive predicate embedded under a past-perfect marked attitude in Samoan also only allows for a shifted reading, as shown in (28). The sentence can be used, for instance, to

report the reason why Heidi won't join us for dinner. However, it cannot be used to explain—say, after getting off the phone with Laura—why Heidi didn't take the call (= because of an ongoing dinner-eating event).

- (28) *Sa ta'u mai e Laura [sa 'ai e Heidi le mea'ai o le aftafi]*  
 TAM(pst.pfv) tell DIR ERG Laura TAM(pst.pfv) eat ERG Heidi the thing.eat of the evening  
 'Laura told me that Heidi had dinner.'<sup>6</sup> (SHIFT only)

The pattern extends to verbs of perception like *iloa* ('to see, to notice'), which generally exhibit a strong preference for simultaneous readings (see, e.g., Kusumoto 1999, pp. 78-79; Dickey 2001, pp. 192, 194). The embedded past perfective in (30a) is only acceptable in the context in (29b), which forces a shifted reading. The embedded imperfective in (30b) is unacceptable in that context, but acceptable in (29a), which allows only for a simultaneous reading.

- (29a) Today is October 8, 2015. Three days ago, Tigilau looked at his calendar and saw a note saying that Sina was staying in Apia that day. (SIM)

- (29b) Today is October 8, 2015. Yesterday, Tigilau looked at his calendar and saw that Sina was staying in Apia on October 5, 2017. (BACKWARD)

- (30a) *Na iloa e Tigilau [sā nofo Sina i Apia]* # (29a), ✓ (29b)  
 TAM(pst.pfv) notice ERG Tigilau TAM(pst.pfv) stay Sina in Apia  
 'Tigilau noticed that Sina had been in Apia.'  
 Comment from a speaker: "Sina has gone back already."

- (30b) *Na iloa e Tigilau [o lo'o nofo Sina i Apia]* ✓ (29a), # (29b)  
 TAM(pst.pfv) notice ERG Tigilau TAM(ipfv) stay Sina in Apia  
 'Tigilau noticed that Sina was in Apia.'

Before we turn to the temporal interpretation of relative clauses, let me summarise: For complement clauses in Samoan, we find the pattern in Table 2 below.

**Table 2:** *The temporal interpretation of complement clauses in Samoan*

	past perfective-under-past perfective	imperfective-under-past perfective
SIMULTANEOUS	#	✓
BACKWARD SHIFTED	✓	#

### 2.2.2 Relative clauses

This is also the pattern we find in relative clauses: With the past perfective and the imperfective, the temporal interpretation of the relative clause is always dependent on the superordinate tense (unlike in English, see also section 4.1 below). A past perfective in a relative clause embedded under a past perfective may only receive a shifted interpretation, (31). In a context that is set up for a simultaneous reading like (32), the past perfective in the relative clause is unacceptable. As one speaker explains: "They are talking after he's finished." In this context, the embedded imperfective is acceptable, however. Embedded under a past perfective, it yields the simultaneous interpretation. A further example is in (33).

- (31) *Sa talanoa Malia ma se tama [sa ita]*  
 TAM(pst.pfv) talk Mary with a boy TAM(pst.pfv) angry  
 'Mary talked to a boy who was angry.' (SHIFT only)

<sup>6</sup> I would like to thank Heidi Quinn (p.c.) for this example.

(32a) A drawing with Mary trying to talk to a performer at a *fiafia* night while he is dancing.

(32b) #*Sa talanoa Malia i le tama [sa siva]*  
 TAM(past.pfv) talk Mary PREP the boy TAM(past.pfv) angry  
 ‘Mary talked to the boy who danced.’ (SHIFT only)

(32c) *Sa talanoa Malia i le tama [‘o lo‘o siva]*  
 TAM(past.pfv) talk Mary PREP the boy TAM(ipfv) angry  
 ‘Mary talked to the boy who was dancing.’ (SIM only)

(33a) A drawing depicting Mary trying to comfort a crying boy.

(33b) *Sa talanoa Malia ma se tama [‘o lo‘o tagi]*  
 TAM(past.pfv) talk Mary with a boy TAM(ipfv) cry  
 ‘Mary talked to a boy who was crying.’ (SIM only)

This simultaneous interpretation also arises if the imperfective is embedded under future ‘*o le ‘ā*, as in (34).

(34a) A picture of Sina at the fish market. She will go there again on Sunday.

(34b) ‘*O le ‘ā fa‘atau Sina le i‘a [‘o lo‘o ola pea]*  
 TAM(prosp) buy Sina the fish TAM(ipfv) alive still  
 ‘Sina will buy a fish that is still alive.’

Recall that relative clauses in English not only allow for simultaneous and backward shifted readings, but also for the later-than-matrix interpretation. Relative clauses in Samoan do not: The sentence in (35) is only acceptable if Cillia married the minister of tourism (and not if her husband was appointed at some point after her marriage).

(35) *Sa fa‘aipoipo Cillia i le tamaloa [sa pitia]*  
 TAM(past.pfv) marry Cillia PREP the man TAM(past.pfv) become  
*fa‘aministā o turisi mo Samoa]*  
 minister of tourism for Samoa  
 ‘Cillia married a man who became the Somoan minister for tourism.’

We summarise our findings regarding the temporal interpretation of relative clauses in Table 3. Unlike in English, relative clauses in Samoan are not temporally independent of the matrix clauses that host them. They pattern just like complement clauses in that their interpretation is always relative to the superordinate structure.

**Table 3:** *The temporal interpretation of relative clauses in Samoan*

	past perfective-under-past perfective	imperfective-under-past perfective
SIMULTANEOUS	#	✓
BACKWARD SHIFTED	✓	#
LATER-THAN-MATRIX	#	n/a

The data can straightforwardly be accounted for when extending the analysis of the matrix cases to the embedded cases: In a nutshell, we derive this pattern by lambda abstraction over (one of) the time arguments of the embedded aspectual operators.

### 3 Analysis

#### 3.1 Simultaneous readings

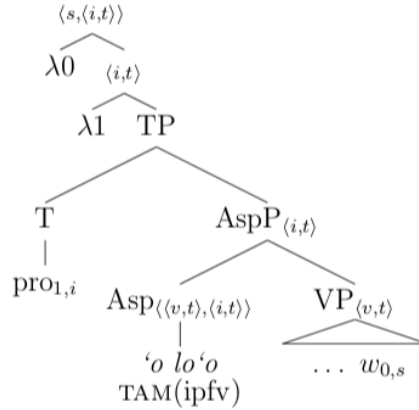
Complement clauses denote tensed propositions of type  $\langle s, \langle i, t \rangle \rangle$ . In the absence of an operator in the T-head, the simultaneous interpretation of the embedded imperfective is a result of lambda abstraction over the covert



temporal proform that we have posited in this syntactic position, as sketched in (36). For our example sentence from (27) above, the complement clause then denotes the tensed proposition in (37), namely that in the evaluation world, there is an ongoing state at the evaluation time of Sina being pregnant.

- (27) *Sa ta'u mai e Malia ['o lo'ō tō Sina]*  
 TAM(past.pfv) tell DIR ERG Mary TAM(ipfv) pregnant Sina  
 'Mary told me that Sina was pregnant.'

- (36) Logical Form for complement clause with imperfective:



- (37) Denotation of complement clause with imperfective:  
 $\lambda w. \lambda t. \exists s [\tau(s) \supset t \ \& \ s \text{ is the state of Sina being pregnant in } w_{@}]$

As composition proceeds, the attitude verb, for which we assume the same lexical entry as in English, in (10a), fills the time argument slot of this tensed proposition with the running time of the matrix saying event, and—under our simplified analysis here—the world argument slot with the actual world. We derive the truth and definedness conditions in (38) for imperfective-under-past perfective.

- (10a)  $\llbracket say_{(\text{simplified})} \rrbracket = \lambda w. \lambda p_{\langle s, \langle i, t \rangle \rangle}. \lambda x. \lambda e. e \text{ is an event of } x \text{ saying in } w \text{ that } p(w)(\tau(e)) = 1$

- (38) Truth and definedness conditions for imperfective-under-past perfective in complement clause:  
 $\llbracket (27) \rrbracket = 1 \text{ iff } \exists e [\tau(e) \subseteq t_c \ \& \ e \text{ is an event of Mary saying in } w_{@} \text{ that}$   
 $\exists s [\tau(s) \supset \tau(e) \ \& \ s \text{ is the state of Sina being pregnant in } w_{@}]]$   
 $\llbracket (27) \rrbracket \text{ is defined iff } t_c < t^*$

The sentence is true if and only if there is an event of Malia saying in the actual world  $w_{@}$  that there is a state of Sina being pregnant in that world. The running time of the saying event must be contained in or equal to a contextually provided evaluation time  $t_c$ , and it must be included in the running time of the pregnancy state. At the time of Mary’s utterance, Sina thus had to have been pregnant (= the simultaneous reading). The presupposition of the past perfective in the matrix clause requires that context provide an evaluation time that is prior to the utterance time  $t^*$ .

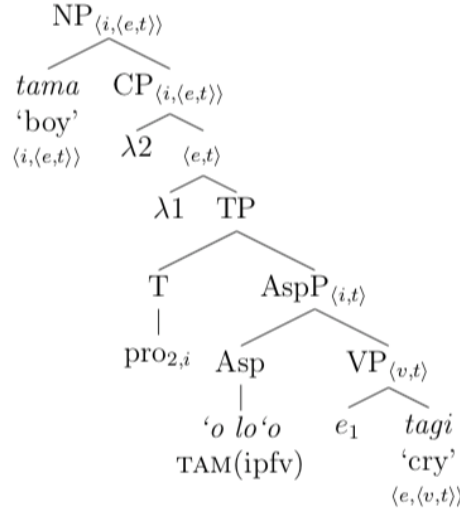
The derivation of the simultaneous reading of relative clauses works in a similar fashion. Relative clauses in Samoan denote tensed properties (type  $\langle i, \langle e, t \rangle \rangle$ ), a result of lambda abstraction over the time variable in T. In the case of the example from (33) above, the noun phrase that contains the relative clause has the structure in (39a) at LF.<sup>7</sup> Its interpretation is in (39b).<sup>8</sup> The dependent interpretation is incompatible with positing an utterance time variable in the CP-layer clause, as we have done in English. As a consequence, relative clauses in Samoan receive a temporally dependent interpretation (see below for further discussion).

<sup>7</sup> Here, the noun combines with the relative clause via Extended Predicate Modification #2: If  $\alpha$  is a branching node and  $\beta$  and  $\gamma$  its daughters,  $\llbracket \beta \rrbracket \in D_{\langle i, \langle e, t \rangle \rangle}$  and  $\llbracket \gamma \rrbracket \in D_{\langle i, \langle e, t \rangle \rangle}$ , then  $\llbracket \alpha \rrbracket = \lambda t. \lambda x. \llbracket \beta \rrbracket(t)(x) = 1 \ \& \ \llbracket \gamma \rrbracket(t)(x) = 1$ .

<sup>8</sup> Just like for English above, we use an extensional semantics here for ease of exposition.

- (33) *Sa talanoa Malia ma se tama* [‘o lo’o tagi]  
 TAM(past.pfv) talk Mary with a boy TAM(ipfv) cry  
 ‘Mary talked to a boy who was crying.’

(39a) Logical Form for relative clause with embedded imperfective:

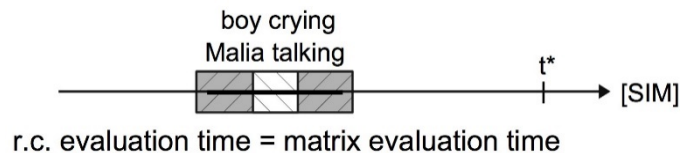


- (39b) Denotation of relative clause with embedded imperfective:  
 $\lambda t. \lambda x. x$  is a boy at  $t$  &  $\exists e [\tau(e) \supset t$  &  $e$  is an event of  $x$  crying]

Modulated by the weak determiner, which we assign a standard analysis, in (40), the matrix clause and the relative clause end up having the same evaluation time. The resulting truth and definedness conditions for (33) are in (41). We derive a simultaneous reading: The (past) evaluation time for the relative clause is also the evaluation time for the matrix clause.

(40)  $\llbracket se$  (‘a, some’)  $\rrbracket = \lambda P_{\langle i, \langle e, t \rangle \rangle}. \lambda Q_{\langle i, \langle e, t \rangle \rangle}. \lambda t. \exists x [P(t)(x) = 1 \ \& \ Q(t)(x) = 1]$

- (41) Truth and definedness conditions for imperfective-under-perfective in relative clause:  
 $\llbracket (33) \rrbracket = 1$  iff  $\exists x [x$  is a boy at  $t_c$  &  $\exists e [\tau(e) \supset t_c$  &  $e$  is an event of  $x$  crying] &  
 $\exists e' [\tau(e') \subseteq t_c$  &  $e'$  is an event of Mary talking to  $x]$   
 $\llbracket (33) \rrbracket$  is defined iff  $t_c < t^*$



### 3.2 Shifted readings

We suggest that in the case of the embedded past perfective, binding does not target the covert temporal proform in T, but rather the presupposition introduced by the aspectual operator (which ultimately determines which time the past is relative to). Let us look at an example, (27). We want to derive that the embedded evaluation time (= to which aspect relates Sina’s pregnancy event) is prior to the matrix evaluation time (= to which aspect relates the talking event). Under our analysis of the past perfective, repeated in (24b), this is going to be a presupposition. In order to relativise the presupposition to the matrix evaluation time, we will have to bind it, as sketched in the Logical Form for (27) in (42).

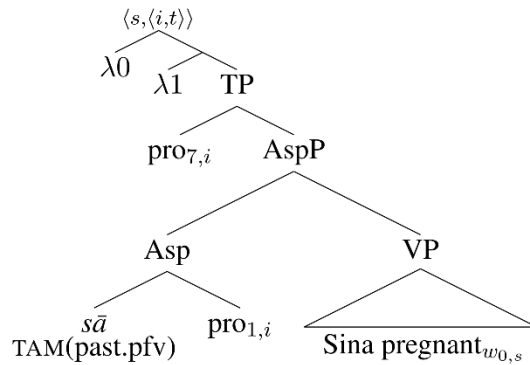
- (27) *Sa ta'u mai e Malia [sā tō Sina]*  
 TAM(past.pfv) tell DIR ERG Mary TAM(past.pfv) pregnant Sina  
 'Mary told me that Sina was pregnant.'

(24b)  $\llbracket \text{sā (past.pfv)} \rrbracket = \lambda t'. \lambda p_{\langle v, t \rangle}. \lambda t : t < t'. \exists e [\tau(e) \subseteq t \ \& \ p(e) = 1]$

(42a) Full Logical Form for perfective-under-perfective in complement clause:

$$[\text{TP} [\text{T pro}_{9,i}] [\text{AspP}_{\langle i, t \rangle} [\text{Asp TAM(past.pfv)} t^*] [\text{VP Malia} [\text{say}_{w@} [\langle s, \langle i, t \rangle \rangle \lambda 0 [\lambda 1 [\text{TP} [\text{T pro}_{7,i}] [\text{AspP} [\text{Asp TAM(past.pfv)} \text{pro}_{1,i}] [\text{VP Sina pregnant}_{w_0}]]]]]]]]]]]]]$$

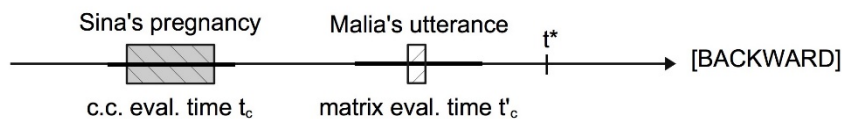
(42b) Tree structure for complement clause with past perfective:



Compositionally interpreting (42) yields (43) as the denotation of the complement clause, and the truth and definedness conditions in (44). For the sentence to be true, the running time of Mary’s utterance must be included in or equal to a contextually provided evaluation time  $t'_c$ , while the running time of Sina’s pregnancy must be included in or equal to a contextually provided evaluation time  $t_c$ . The sentence presupposes that the matrix evaluation time  $t'_c$  precedes the utterance time but is later than the embedded evaluation time  $t_c$ . This presupposition gives us a backward shifted interpretation.

- (43) Denotation of complement clause with embedded perfective:  
 $\lambda w. \lambda t : t_c < t. \exists s [\tau(s) \subseteq t_c \ \& \ s \text{ is the state of Sina being pregnant in } w]$

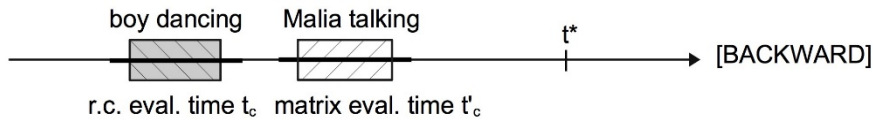
- (44) Truth and definedness conditions for perfective-under-perfective in complement clause:  
 $\llbracket (42) \rrbracket = 1$  iff  $\exists e [\tau(e) \subseteq t'_c \ \& \ e$  is an event of Mary saying in  $w@$  that  
 $\exists s [\tau(s) \subseteq t_c \ \& \ s$  is the state of Sina being pregnant in  $w@$ ]]  
 $\llbracket (42) \rrbracket$  is defined iff  $t'_c < t^*$  and  $t_c < t'_c$



The analysis of relative clauses proceeds in an analogous manner: We require the presupposition of the embedded past perfective to be bound. For our example from (32), the relative clause has the Logical Form in (45a) and the denotation in (45b). We derive the truth and definedness conditions in (46). The presupposition of the relative clause regarding the local evaluation time is going to be relative to the matrix evaluation time, yielding a backward shifted interpretation.

- (32) *Sa talanoa Malia i le tama [sa siva]*  
 TAM(past.pfv) talk Mary PREP the boy TAM(past.pfv) angry  
 'Mary talked to the boy who danced.'

- (45a) Logical form for relative clause with embedded perfective:  
 $[_{CP<_{i,<e,t>}} \lambda 2 [_{<e,t>} \lambda 1 [_{TP} [_{T} pro_{7,i}] [_{AspP} [_{Asp} TAM(past.pfv)} pro_{2,i}] [_{VP} e_1 cry] ] ] ] ]$
- (45b) Denotation of relative clause with embedded perfective:  
 $\lambda t : t_c < t. \lambda x. \exists e [ \tau(e) \subseteq t_c \ \& \ e \text{ is an event of } x \text{ dancing}]$
- (46) Truth and definedness conditions for perfective-under-perfective in relative clause:  
 $\llbracket (32) \rrbracket = 1$  iff  $\exists e' [ \tau(e') \subseteq t_c \ \& \ \exists x [ x \text{ is a boy at } t'_c \ \& \ \exists e [ \tau(e) \subseteq t_c \ \& \ e \text{ is an event of } x \text{ dancing}] \ \& \ e' \text{ is an event of } M \text{ talking to } x]$   
 $\llbracket (32) \rrbracket$  is defined iff  $t_c < t'_c$  and  $t'_c < t^*$



Now that the analysis of both embedded perfective and embedded imperfective in complement and relative clauses is in place, let us take a step back. The analysis of the backward shifted reading of complement and relative clauses that we have developed in this section relies on binding of the temporal presupposition of the embedded past perfective, which at this stage is a mere stipulation. (But a necessary one, as we will see in a moment.) In the remainder of this section, I am going to show that syntactically representing presuppositional material for the purposes of binding (which we, somewhat laxly, refer to as presupposition binding here) is independently needed in the grammar. We are then going to go back to our data and explore what would happen if we were to abstract over the temporal proform in T, like we do in the case of an embedded imperfective.

Presupposition binding (= binding syntactically represented, presuppositional material) is also a useful tool in the analysis of the interaction between quantifiers and presupposition triggers (see Beck 2007; Hohaus 2015, pp. 97-105). In English, one such trigger is *again* in (47). In the example, the presupposition is anaphoric to the prior time introduced in the utterance context. At Logical Form, this is reflected in a morphologically null free time variable. The presupposition may however also be dependent on a quantifier as in (48): Here, there is no one time that the presupposition is anaphoric to. The time which satisfies the presupposition of *again* is different for every of three years.

- (47a) (Mary gave her mother a big smile. A couple of minutes later:) *Mary smiled again.*  
 Assertion: ‘Mary smiled.’  
 Presupposition: ‘Mary has smiled before.’

(47b)  $\llbracket again \rrbracket = \lambda t'. \lambda p<_{i,t'}. \lambda t : t' < t \ \& \ p(t') = 1. p(t) = 1$

(47c)  $[ t^* [_{TP} PAST_{C_{7,<_{i,t'>}} [ [ again_{t_{9,i}} ] [_{AspP} PFV [_{VP} Mary smile ] ] ] ] ] ] ]$

- (48) (In 1995, 1996 and 1998, Bill was sick on Labour Day.)  
*In each of these years, he was sick again on Thanksgiving.* (Beck 2007, p. 24, no. (32))

Without going into the details of the analysis here (but see Beck 2007, pp. 24-28), establishing the right kind of dependency between the quantifier and the presupposition requires that the presupposition trigger introduces a time variable in the syntax for the quantifier to bind (in addition to a contextually provided selection function that narrows the time interval of an entire year to Labour Day), as sketched in (49).

(49)  $[ [ every\ year\ C_{9,<_{i,t'>}} [ \lambda 1 [ \dots [ [ again_{f_{7,<_{i,t'>} t_{1,i}} ] ] [_{AspP} PFV [_{VP} Bill\ sick ] ] \dots ] ] ] ] ] ]$

Our analysis of the relational reading of the embedded past perfective is structurally similar: The time argument relating to the temporal presupposition of the perfective is syntactically accessible and may thus be bound for

the purpose of creating the right semantic type for the interpretation of the embedded structure, type  $\langle s, \langle i, t \rangle \rangle$  in the case of the complement clause and type  $\langle i, \langle e, t \rangle \rangle$  in the case of the relative clause.

Why abstract over the temporal presupposition of the perfective in the first place, though? For the sentence from (27), an alternative Logical Form might suggest itself, as sketched in (50). Here, lambda abstraction is over the temporal proform in T, and the first time argument of the perfective is a free variable (here, indexical to the utterance time). The truth and definedness conditions that we would then derive are in (51). Crucially, they require the running time of the embedded eventuality  $\tau(s)$  to overlap with or be contained in the running time of the matrix event  $\tau(e)$ , the duration of Mary’s utterance. This is implausible assuming that communication is instantaneous (and even impossible in this particular case), of course.

- (27) *Sa*            *ta’u*   *mai*   *e*   *Malia*   [*sā*            *tō*        *Sina*]  
TAM(past.pfv) tell    DIR    ERG    Mary   TAM(past.pfv) pregnant Sina  
‘Mary told me that Sina was pregnant.’

- (50) An alternative Logical Form for perfective-under-perfective in complement clause?

$$[\text{TP} [\text{T } \text{pro}_{9,i}] [\text{AspP}_{\langle i, t \rangle} [\text{Asp TAM(past.pfv)} t^*] [\text{VP Malia} [\text{say}_{w@} [\langle s, \langle i, t \rangle \rangle \lambda 0 [\lambda 7 [\text{TP} [\text{T } \text{pro}_{7,i}] [\text{AspP} [\text{Asp TAM(past.pfv)} t^*] [\text{VP Sina pregnant}_{w_0, s} ]]]]]]]]]]$$

- (51)  $\llbracket (50) \rrbracket = 1$  iff  $\exists e [\tau(e) \subseteq t_c \ \& \ e$  is an event of Mary saying in  $w@$  that  
 $\exists s [\tau(s) \subseteq \tau(e) \ \& \ s$  is the state of Sina being pregnant in  $w@$ ]]  
 $\llbracket (50) \rrbracket$  is defined iff  $t_c < t^*$  and  $\tau(e) < t^*$

The Logical Form in (50) might therefore be ruled out. We will have to leave it open here, though, in how far implausibility is enough to explain why lambda abstraction may only target the time variable related to the presupposition in the case of an embedded past perfective. For discussion of a related question for English, see von Stechow, Heim, and Schwarzschild (2017, pp. 35-40), who point out that if plausibility is decisive here, we might be able to manipulate it in our favour in scenarios where the running time of the embedded eventuality is really short. We will leave this question for further research.

### 3.3 Interim summary

We find that in Samoan, for the two TAM that we have investigated here, the temporal interpretation of relative and complement clauses always depends on the superordinate structure, as summarised in Table 4. The interpretation of an imperfective embedded under an imperfective thus yields a simultaneous reading in both complement and relative clauses. Embedding a past perfective under a past perfective in either construction yields a backward shifted interpretation.

*Table 4: The temporal interpretation of complement and relative clauses in Samoan*

	imperfective-under-past perfective	past perfective-under-past perfective
complement clauses	SIMULTANEOUS	BACKWARD SHIFTED
relative clause		

The simultaneous interpretation of imperfective-under-past perfective falls out right away from the architecture that we have proposed for Samoan tense and aspect, under which ‘o lo ‘o encodes the imperfective aspect and there is just a proform over times in T, which gets abstracted over when embedded. (This analysis also correctly predicts that imperfective-under-prospective receives a simultaneous interpretation, although this has not been our focus here.) The backward shifted interpretation of the embedded past perfective comes with a twist, as this is an aspectual operator which also introduces a presupposition that the evaluation time (= provided by the temporal proform in T) must be past relative to another time. It is this time argument that we abstract over in order to get a relative past interpretation in embedded environments, the backward shifted reading.

## 4 Concluding remarks

### 4.1 *Contrasting English and Samoan*

Let us briefly point out some lexical and structural differences between English and Samoan when it comes to the composition of temporal meaning in subordinate constructions. In English, past-under-past in complement clauses is structurally ambiguous (by virtue of a sequence-of-tense deletion rule, or the like). Samoan can be characterised as tenseless in that the language lacks temporal operators in T. As a consequence, any type of sequence-of-tense rule cannot apply, as should be particularly clear in the case of imperfective-under-imperfective. We might however want to ask whether the mechanisms that derive simultaneous readings of past-under-past in complement clauses in English may apply to past perfective-under-past perfective in Samoan. Given the nature of the Samoan past perfective, we believe that it cannot either: To put it naively, deletion would have to target the aspectual head. If the lower past perfective were to be deleted, the aspectual meaning would be deleted along with the temporal presupposition, resulting in a type mismatch, as sketched in (52).

(52) [TP [T  $pro_{9,i}$ ] [<sub>AspP</sub> [<sub>Asp</sub> past.pfv  $t^*$ ] ... [TP [T  $pro_{7,i}$ ] ~~[<sub>AspP</sub> [<sub>Asp</sub> past.pfv] [VP ... ]]]]]]~~

Samoan thus does not seem to create the right kind of structural environment in complement clauses for a sequence-of-tense rule to apply (and thus differs from languages in which such a rule does not apply, despite the right kind of LF configuration; see the next subsection below).

How do English and Samoan relative clauses compare? Under the analyses presented here, English relative clauses differ from their Samoan counterpart in semantic type (type  $\langle e, t \rangle$  versus type  $\langle i, \langle e, t \rangle \rangle$ ). This variation derives from the stipulation that English relative clauses host a temporal pronoun indexical to the utterance time, which the tense operator is interpreted in relation to. Under the analysis presented here, the CP-layer of the Samoan relative clause does not host such a temporal indexical, and the evaluation time variable in a Samoan relative clause is abstracted over. We have yet to understand the reasons underlying this variation.

### 4.2 *The broader cross-linguistic picture*

As far as the broader cross-linguistic picture is concerned, Samoan contributes a new pattern to the interpretation of embedded tenses (see, e.g., Kusumoto 1999, Grønn and von Stechow 2010, Ogihara and Sharvit 2012, Ogihara 2015). In Samoan, both attitude complements and relative clauses are necessarily interpreted as temporally dependent on the superordinate structure. All of the languages that have featured prominently in the research literature on embedded tenses (English, German, Japanese and Russian, in particular) appear to allow temporally independent interpretations of relative clauses, even though they vary with respect to the interpretative possibilities for complement clauses. Japanese (53), unlike its English counterpart, only allows for the backward shifted interpretation, for instance:

(53) *Bernhard-wa Junko-ga byooki-dat-ta to it-ta* (Japanese)  
 Bernhard-TOP Junko-NOM sick-be-PAST COMPL say-PAST  
 ‘Bernhard said that Junko was sick.’ (BACKWARD only)  
 (Kusumoto 1999, p. 84, no. (118))

The latter variation is often couched as parametric variation in the availability of a sequence-of-tense rule [ $\pm$ SoT]. While Samoan has the appearance of  $[-$ SoT], the variation we observe falls outside of the scope of the parameter: As we have seen in the previous subsection, even if a sequence-of-tense rule would exist for Samoan, it might not be able to apply. Vice versa, the simultaneous readings for which we require such a mechanism in English, in Samoan come about by a different structural configuration, the embedded imperfective aspect. The view from Samoan thus not only highlights the importance of aspectual meaning for the temporal interpretation of subordinate constructions, it also raises interesting questions regarding the different components of the grammar that are involved in the composition of temporal meaning (and of variation therein). Only the in-depth study of a larger sample of typologically diverse languages will be able address these questions.

### Abbreviations used in glosses

COMPL = complementiser, DEM = demonstrative, DIR = directional particle, ERG = ergative, ipfv = imperfective, NOM = nominative, pfv = perfective, pl = plural, PREP = preposition, prosp = prospective, sg = singular, TAM = temporal-aspectual marker, and TOP = topicalisation.

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I am indebted to the Samoan speakers who have contributed to this and other research projects over the years, *fa'afetai*. 'Ou te matuā 'iate 'outou. For comments and discussion, I would like to thank the audiences at the Manchester Semantics and Philosophy Lab and the 24th Annual Meeting of the Austronesian Formal Linguistics Association, as well as Sigrid Beck, Ryan Bochnak, Shiwei Chen, Anna Howell, Anne Mucha, Uli Sauerland, Toshiyuki Ogihara, and Heidi Quinn. Peter Klecha and David J. Medeiros kindly agreed to review this paper and provided helpful comments.

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