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Use of citation forms in academic texts by writers in the L1 & L2 context

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Abstract

This study investigates use of citation forms in 30 scientific research articles in biology, chemistry and physics written by writers in L1 and L2 contexts. Citation forms were divided into integral (citation outside brackets) and non-integral (citation inside brackets). Integral citation was further categorized into subject position, non-subject position and noun phrase such as "according to". Findings show that although a few papers were cited in integral citation across the disciplines, writers in the L2 context mainly employed them in a subject position, while writers in the L1 context spread them over three positions creating a stylistic variation.

Key words: L1 & L2 writers, citation forms, citation analysis, scientific discourse

1. Introduction

To be able to produce academic texts in English, non-English speaking (L2) novice writers need to master various means to strengthen their argument in English, one of which is thought to be citation (Block & Chi, 1995; Charles, 2006; Dong, 1996; Duvois, 1987; Harwood, 2004; Hyland, 1999, 2001; Salager-Meyer, 1999). They need to learn not only what to cite but also how to cite the previous studies (Swales, 1986, 1990, 2004). Previously although disciplinary variation in the use of citation and citation forms has been analyzed (Hyland 1999, 2000), relatively little attention has been paid to the variation due to their linguistic environments. It may be the case that those working in the non-English speaking environment (L2 context) have more difficulty in the use of citation forms to construct a persuasive argument as than those in the English speaking environment (L1 context). This study thus compares use of citation forms in 30 scientific texts in biology, chemistry and physics written in the L1 & L2 contexts.

2. Previous studies

In discourse analysis, citations have often been examined with reference to reporting verbs (Charles, 2006; Hunston & Thompson, 2003; Hyland, 1999, 2001; Shaw, 1992; Thomas & Hawes, 1994; Thompson and Ye, 1991). For example, Thompson & Ye (1991) studied the introduction sections of more than 100 papers to examine how writers show their evaluation of previous work, and interact with their discourse community, through the reporting verb. They also showed that writers reveal positive and negative evaluation of previous studies by the choice of reporting verbs. It appears that negative opinion is often presented in a subtler manner in context than positive evaluation, (Thompson & Ye, 1991: 374) and might therefore only be evident to insiders of the discipline.

This insiders' perspective in citation has been investigated in the studies on citation analysis, which are closely associated with the disciplines of information science and sociology of science, (Cozzens, 1985; Small, 1982; Shadish et al. 1995; White & Wang, 1997). However, although integration of the findings of studies on citation analysis with discourse analysis has long been proposed-early on by Swales (1986) and more recently by Harwood (2004) and White (2004), researchers in these disciplines seem still unfamiliar with the achievements of one another (White, 2004). Because citation is crucial in the analysis of academic texts (Hyland, 1999, 2000), it seems that researchers in discourse analysis can benefit from findings of information science/sociology of science.

Citation analysis is a relatively new area of study originating from an initiative to launch citation indexing by the pioneering information scientist Garfield (1955) but has had three approaches (Liu, 1993; White, 2004), which can show some resemblance to those of discourse analysis. The first mainly concerned the retrieval of cited work in the discourse community (Garfield, 1955; Cole, 2000). The number of citations was used as a criterion to judge the importance of the work within the discipline, based on the assumption that the more citations a paper obtains, the greater impact it has on the academic community (Cole & Cole, 1971; Merton, 1973). The notion of the frequency of citation (i.e. the citation count) dominated analysis at this stage. In discourse analysis, this can be compared to quantitative analysis of linguistic forms such as investigating the frequency of passive voice compared with active voice (Salager-Meyer, 1992).

However, citation counting was soon criticized because papers are not all cited for the same reason. It was argued that the analysis needs to examine the function of the citations within a text; as some are employed to help to establish a theoretical framework while others are cited negatively

(Duncan et al., 1981; Moravcsik & Murugesan, 1975). Thus categories such as negative citation and developmental citation were created to classify the roles of cited work in a paper, initiating the second approach to citation analysis: content analysis (Chubin & Moitra, 1975; Moravcsik & Murugesan, 1975). In the 1970s researchers on citation analysis tried to examine the surrounding context of citation. Interestingly a similar tendency was also found in discourse analysis; Shaw (1992) for example pointed out that the choice of passive vs. active was influenced by the organization of information in a text rather than any decision at the sentence level.

Despite some genuine efforts to classify the content of citations, the limitations of this approach became apparent. First, it was found that one citation may belong to more than one category (Moravcsik & Murugesan, 1975). Second, the same range of categories can not be used across all disciplines (Chubin and Moitra, 1975; Moravcsik & Murugesan, 1978). Third as coding was conducted by human hands with a complex categorizing system, it can be subjective (Howard, 2004). Last but importantly, MacRoberts and MacRoberts (1984) claimed that linguistic analysis of citation does not always reveal the real intention of the writer because writers may mitigate their critical comments, which led demands for understanding of the writers' intention behind the citation. Thus the third approach has moved analysis to consider the citers' motives for citation (Budd, 1999; Cronin, 1998; Shadish et al. 1995; Wang & White, 1999; White 2004). Two types of motivation were put forward, based on either normative theory or on a micro-sociological perspective (Liu, 1997). The former assumes that citation is for merit-granting, which was originally considered to be the main reason for citation (Cole & Cole, 1967, 1976; Merton, 1973; Davenport & Cronin, 2000) as citation is part of the collective activity of knowledge construction in the discourse community. By contrast, the latter argues for persuasion—the citer's knowledge claim as the major motivating factor in citation (Brooks, 1984; Case & Higgins, 2000; Latour, 1987). In an influential paper, Gilbert (1977) argued strongly that writers cite in order to persuade their readers. His argument was so influential that it shifted attention from citation itself to the role of citation in a text, examining the individual writers' viewpoint rather than that of the discourse community. He argued that works by authoritative figures in the discipline were cited because they are more persuasive in the discourse community. However, as his argument raised some questions (Cozzens, 1989; Zuckerman, 1987), subsequent studies have tried to balance the argument by presenting the idea of "rhetoric first, reward second" (Cozzens, 1989), and this was confirmed by interviews with writers of academic texts about the motivation for citation (Brooks, 1986; Shadish et. al, 1995; Vinkler, 1988; Wang & White, 1999; Case & Higgins; 2000).

Some discourse analysts also took a similar approach to understand the writers' motivation behind the impersonal linguistic forms. Myers (1989, 1990) suggests the analysis of a social

dimension in scientific discourse, showing how scientific research articles employ politeness strategies: positive politeness for solidarity, and negative politeness for deference to the discourse community (1989, 1992). Hyland's studies (1999, 2000) combined interviews with academics and analysis of a large corpus of academic texts, presenting the similar views of the citers' motivation found in citation analysis (Brooks, 1986; Cozzens, 1989). He states:

"Reference to previous work is virtually mandatory in academic articles as a means of meeting priority obligations and as a strategy for supporting current claims." (p.362, 1999).

While citation analysis focuses on the use of citation itself, discourse analysis could further enquire into the purposes of citation forms. Citation forms may have the same purposes as those of citation found in citation studies. So far citation forms have been categorized into two types (Swales, 1990): integral for citation outside brackets, and non-integral for that inside brackets, and integral citation was further divided according to the syntactic position and the role in a sentence (Charles, 2006; Hyland, 1999). Hyland divided integral citation into three categories.: subject, non-subject (passive) and part of noun-phrase (adjunct agent structure) (1999, p.347). Findings of the studies on citation forms show that social science disciplines such as politics use more integral citation forms than do natural sciences (Charles, 2006; Hyland, 1999).

In an analysis of his academic corpus, Hyland found that physics, mechanical engineering, and electronic engineering papers prefer non-subject position to subject position showing it's the disciplines' preference for the impersonal structure of a sentence with noun-phrase construction being the least common choice (less than 20% of all the integral citation forms) in these disciplines. In contrast, biology was the only field that preferred subject position (46.7%) to non-subject position (43.3%) for integral citation, although noun-phrase construction seems to be the least common choice (less than 20% of all the integral citation forms) in other disciplines he examined.

However, although proportional differences in the use of citation forms have been examined across the disciplines, few studies have analyzed any variations in the use of citation forms due to the writers' language backgrounds. Although writers in the L2 context share the similar knowledge about the citation practice, they may not always be linguistically as skillful as those in the L1 context in its realization in their own texts, as was shown in an analysis of a cover letters written by L1 and L2 professionals accompanying a manuscript for publication (Okamura & Shaw 2000). The analysis may help to clarify what L2 novice writers need to pay attention to when they use citation forms.

3. Research questions & data collection

3.1. Research questions

To investigate use of citation forms in academic texts and compare them between L1 & L2 writers, this study examines in scientific research articles written by writers in the L1 & L2 contexts in three scientific disciplines in respect of: 1) use of integral and non-integral citation forms, 2) use of integral citation in three locations, and 3) purpose of citation forms.

3.2. Data collection

The analysis of research articles was limited to three scientific disciplines published only in American journals* (see Appendix 1); this is to avoid any influence from national scientific communities. The textual data is shown in Table 1.

Table 1 Number of papers and discipliens analysed

disciplines	Number of papers
chemistry	7 (3 papers by writers in the L1 context and 4 papers by writers in the L2 context)
biology	11 (6 papers by writers in the L1 context and 5 papers by writers in the L2 context)
physics	12 (5 papers by writers in the L1 context and 7 papers by writers in the L2 context)

The journals were recommended by subject specialists as being prestigious in their discipline and the articles were chosen at random from issues published in 2001, including only full research articles and excluding review articles and short communications of one or two pages. Integral citations were counted first in relation to the total nunber of citations. The total number of cited works was based on the number of papers in the references at the last part of the paper. Then integral citaitons were categorised according to their syntactic functions of subject, non-subject (passive) and part of noun-phrase (adjunct agent structure) such as “according to ...” adopted by Hyland (1999, p.347). Token and type numbers of the integral citation in an individual paper were counted to identify whether the same paper was cited more than once by the writers. The number of integral citations and use of syntactic locations were presented according to the three scientific disciplines and writers’ language backgrounds. Here I shall adopt Hyland (1999), and Thompson & Ye’s (1991) definition of “writers” referring to those citing papers and the cited person as the “author”.

Because it is not so easy to distinguish L1 writers from L2 writers from the names, in this study the distinction is only made between those in the L1 context and L2 context based on the affiliation of the writers. Writers in the L1 contexts were affiliated to the universities in English speaking countries, while writers in the L2 context were Japanese writers working for universities in Japan. Japanese writers were chosen here because they are one of the major L2 contributors of scientific research articles (Swales, 2004). I avoided papers that were the result of collaboration between English speaking countries and Japan.

4. Results

4.1. Writers' use of citation forms in scientific disciplines due to the L1 & L2 language contexts.

Table 2 shows the number of integral and non-integral citation forms and the distribution of integral citation according to three positions in the 31 research articles. As was shown in the academic texts in hard scientific fields in Hyland's corpus (1999), writers in both L1 and L2 contexts equally employed a smaller number of integral citation than to non-integral citations. Among the 30 papers from the disciplines of physics, chemistry and biology, writers in the L1 context employed only 6.4% and writers in L2 context only 5.5% for integral citation of the total citation forms.

Among the these fewer instances of the use of integral citation, a sharp difference appeared in the location in a sentence; writers in the L1 context used integral citation mainly for non-subject position (50%). Thus writers in the L1 context made fairly limited use of a subject position (27%). Because both positions of non-subject and noun phrases enable the subject of a sentence to be impersonal, these locations can be chosen to support positivist principles of science (Scollon and Scollon 2001). In contrast writers in the L2 context used almost 70% of all the integral citation forms in a subject position, with a few instances of them in other positions.

Table 2 Use of integral and non-integral citation forms in writers' papers in biology, chemistry and physics in the L1 & L2 contexts.

Language contexts	Total number of papers	Total citation	Total integral	Instances of the use of integral citation form (% in the total number of integral citation)		
L1 (English)	15	447	26	Subject	non-subject	Noun phrase
				7	13	6
%		100	5.8	26.9	50.0	23.1
L2 (Japanese)	15	394	25	Subject	non-subject	Noun phrase
				17	4	4
%		100	6.3	68.0	16.0	16.0

Since the proportion of the subject position in scientific texts in Hyland's corpus (1999) roughly corresponds to the usage of writers in the L1 context, the dominant use of a subject position by writers in the L2 context in Table 2 appear to be deviant from the norms and requires a more detailed analysis.

4.2. Writers' use of integral citation in three locations across the disciplines.

Table 3 shows the disciplinary variation of the use of integral citation in papers written by writers in the L1 & L2 contexts. Table 3 shows that across the disciplines the subject position seems to be dominant among the writers in the L2 context, while the non-subject position is the most common among those in the L1 context. The difference was most evident in biology papers as they used integral citation most compared to papers in other disciplines, as was also shown in Hyland's large corpus (1999).

Table 3 Disciplinary variations of the use of integral citation

Disciplines Language contexts	Total citation	Number of integral citation	Subject position	Non-subject position	Noun phrase
chemistry					
L1 (English) (3 papers)	86	5	**1**	**2**	2
L2 (Japanese) (4 papers)	94	4	**2**	**1**	1
Total=>	180	9	3	3	3
biology					
L1 (English) (6 papers)	227	18	**6**	**10**	2
L2 (Japanese) (5 papers)	174	13	**11**	**1**	1
Total=>	401	31	17	11	3
physics					
L1 (English) (6 papers)	134	3	**0**	**1**	2
L2 (Japanese) (6 papers)	126	8	**4**	**2**	2
Total=>	260	11	4	3	4

Because the numbers above may reflect individual writers' choice rather than disciplinary and language background differences, Table 4 presents individual papers' use of integral citation together with type and token number of cited papers there. Table 4 shows that due to the small number of the instances of integral citation, little variance was found in the token number of integral citation among chemistry and physics papers. In contrast, employing much more instances of integral citations, biology papers show diversity in their token number. Three biology papers employed no integral citations, while one biology paper used six tokens of integral citation. One shared element of papers across the disciplines was the maximum token number of integral citation in a paper; it was limited to six in the three disciplines. It is interesting that this maximum number was employed in one biology paper written by writers in the L1 context, but none of them appeared in a subject position supporting the preference of the writers in the L1 context as shown in Table 2.

Table 4 Individual papers' use of integral citation forms

Chemistry

Language contexts	Total number of citation	Token/type number of integral citation forms	Subject position	Non-subject position	Noun phrase
L1 (English)	32	0	0	0	0
L1 (English)	30	2/1	0	1	1
L1 (English)	24	3/1	1	1	1
Sub-total	86	**5/2**	**1**	**2**	**2**
L2 (Japanese)	19	1/1	0	1	0
L2 (Japanese)	41	3/3	2	0	1
L2 (Japanese)	19	0	0	0	0
L2 (Japanese)	15	0	0	0	0
Sub- total	94	**4/4**	**2**	**1**	**1**
Total	180	**9/6**	**3**	**3**	**3**

Biology

Language contexts	Total number of citation	Token/type number of integral citation forms	Subject position	Non-subject position	Noun phrase
L1 (English)	44	6/3	0	5	1
L1 (English)	**42**	**4/3**	**1**	**3**	**0**
L1 (English)	41	2/2	1	1	0
L1 (English)	26	1/1	1	0	0
L1 (English)	42	5/2	3	1	1
L1 (English)	32	0	0	0	0
Sub- total	227	**18/11**	**6**	**10**	**2**
L2 (Japanese)	**24**	**4/4**	**4**	**0**	**0**
L2 (Japanese)	23	5/3	4	1	0
L2 (Japanese)	47	0	0	0	0
L2 (Japanese)	34	4/3	3	0	1
L2 (Japanese)	46	0	0	0	0
Sub- total	174	**13/11**	**11**	**1**	**1**
Total	401	31/22	17	11	3

Physics (theoretical and experimental papers)

Language contexts	Total number of citation	Token/type number of integral citation forms	Subject position	Non-subject position	Noun phrase
L1 (English) (theoretical)	9	0	0	0	0
L1 (English (theo))	11	1/1	0	0	1
L1 (English (theo))	6	1/1	0	0	1
L1 (English (theo))	28	1/1	0	1	0
L1 (English (theo))	26	0	0	0	0
L1 (English (experimental))	54	0	0	0	0
Sub- total	134	3/3	0	1	2
L2 (Japanese(theo))	32	2/2	0	0	2
L2 (Japanese (exp))	28	1	1	0	0
L2 (Japanese (exp))	30	0	0	0	0
L2 (Japanese (exp))	22	1	1	0	0
L2 (Japanese (exp))	28	3/3	2	1	0
L2 (Japanese (exp))	14	1	0	1	0
Sub- total	126	8	4	2	2
total	260	11/11	4	3	4

Why do writers in the L1 context tend to use integral citation in a non-subject location? What can be the motives for the use of integral citation?

4.3. Purpose of citation forms

Studies in citation analysis have found that citation is to persuade readers and acknowledge previous studies (Brook 1994,1996; Cozzens, 1989). This study investigates whether this applies to the choice of citation forms in scientific research articles. To examine the purpose behind the use of citation forms, integral citation was chosen because it stands out in a text more than non-integral citation; writers need to be more selective about what to cite in integral citation.

First integral citation was examined in relation to their token and type ratio because if the same papers were cited in integral citation more than once in a paper, it can be hypothesized that the integral citation would carry the writers' certain purpose. Among 30 papers analyzed, no more than 13 papers in total employed more than one instance of integral citation in a paper. In terms of disciplinary variation, of these 13 papers, only two were from physics papers. Writers of physics papers do seem to be keen on maintaining impersonal stance in their writing. Little difference was found due to the writers' language backgrounds in the number of instances of integral citation; of the 13 papers with more than one instance of integral citation, seven were by writers in the L1 context and six by those in the L2 context.

However, the analysis shows that six papers cited the same paper more than once in integral citation; they were all from chemistry and biology; no papers in physics referred to the same paper more than once. Four of them were written by writers in the L1 context, while only two papers by those in the L2 context cited the same paper more than once in integral citation. Obviously as it is a small difference we need a further evidence for a gap between writers in the L1 & L2 contexts. Referring to the same work in integral citation more than once indicates the writers' appreciation of the work cited, which seems to be in the same line with one aspect of citers' motivations as was found in studies in citation analysis (Budd, 1999; Cronin, 1998; Shadish et al., 1995; Wang & White, 1999; White 2004). The reference to the same work more than once in integral citation seem to show citation forms as one way to create a link with some important previous studies and to acknowledge contribution of these studies.

Papers were also compared in relation to the location of integral citation. Four instances was the maximum token number per paper of integral citation in a subject position among all the papers analysed. There was little difference in the maximum token number in papers written by writers in the L1 & L2 contexts with three and four instances respectively. However, a difference appeared in the most common location of instances of token numbers as shown before. Why is this the case?

Answers can lie in the writers' linguistic awareness aiming to control the reader's attention.

As the subject position may break the flow of scientific argument with the insertion of cited authors' names, its frequent use may not be helpful to expand the writers' own argument and to direct readers into the writers' knowledge claim. Furthermore, as the subject position gives more prominence to the authors than the non-subject position and part of noun-phrase construction, it can draw more attention than the writers intend to. Thus unless the writers attempt to pay a special tribute to the work cited, they may avoid the subject position for integral citation. By the same token, non-subject position and noun phrases for integral citation may create some variation in a text and the use of three locations can help to produce a gradual shift of attention to and from cited authors. It seems that this is why writers in the L1 context avoid relying heavily on a subject position. Indeed, the six papers which employed more than one integral citation in a subject position, but only one is written by writers in the L1 context.

The following two extracts from biology papers written in the L1 & L2 contexts show how writers explore the amount of attention to be paid to the cited authors; both employed four integral citations but in different places. The first biology paper was written in the L2 context with four integral citations in a subject position.

Excerpt 1

Demura and Fukuda (1994) and Fukuda (1997), have presented a hypothesis that the process of differentiation of zinnia mesophyll cells into tracheary elements is divided into three stages; ... Iwasaki and Shibaoka (1991) examined the time at which exogeneous BL is required if zinnia cells are to differenciate into tracheary elements and indicated that the BL-requring stage is late stage II. We have demonstrated that BL is a prerequisite for the expression of stage III-specific genes but not for that of stage I-or stage II-related genes (Yamamoto et al. 1997).

The first integral citation can be employed for acknowledgement as the authors were two of writers of the citing paper. The second integral citation seems to be employed to draw an attention to a contrast between the cited paper and the writers' paper. However, do they need to have the cited authors in a subject position for the sake of persuading readers? A contrasting pattern was found in a paper by writers in the L1 context.

Excerpt 2

Earlier studies with broccoli florets, stored at 5C, showed that fatty acid levels decreased during postharvest senescence, and levels of peroxidation products increased at both 5C and

room temperature (Zhuang et al., 1995, 1997). These authors concluded that lipid deterioration of broccoli in storage.

In contrast to the observations made on the material stored at room temperature, we observed a significant increase in the TBARM content in tissures stored at 4C similar to that reported by Zhang et al. (1995).

Although writers here also seem to employ integral citation to focus on the contrast between the two papers, the writers seem to emphasize their own work with *we observed* and try not to draw more attention to the cited paper with the use of non-subject position, *reported by Zhang et al. (1995)*. The use of *earlier studies* and *these authors* seems to avoid both the repetition of the same work in integral citation and the unnecessary focus on previous studies while maintaining the readers' attention to their own work.

5. Discussion and conclusion

This study has investigated how writers in the L1 & L2 context use citation forms in research articles in chemistry, biology and physics to construct a persuasive argument. The results show that both writers use the integral citation forms only 5 to 6 percent of the total number of cited papers in the scientific research papers examined here, confirming much fewer instances of integral citation in the scientific research papers than those in social science and humanities in Hyland's large corpus (1999, 2001). Although integral citation may play a relatively minor role in a text due to its fewer instances, it does not mean that they are less important. Selective use of integral citations seems to achieve the writers' purposes.

Among the three disciplines compared in this study, biology papers employed integral citation most as was also shown in Hyland's study (1999). It can be said that biology papers allow more personal involvement in scientific discourse, while with much fewer instances of integral citation chemistry and physics papers prefer to maintain impersonal stance to the writers' argument.

When it comes to the difference between the writers in L1 & L2 contexts, as the number of the instances of integral citation was so small that there was no appreciable difference between contexts for papers in chemistry and physics. In biology papers, however, the difference in the use of integral citation was evident in terms of the location of integral citation and the repetitive reference to the same work in integral citation.

The difference seems to lie in their attention to functional roles of integral citation. Writers in

the L1 context seem to be more conscious of what to cite in integral citation and where to cite them to strengthen their own argument in scientific disciplines. For this purpose, writers in the L1 context referred to the same work more than those in the L2 context. They also avoid a subject position for integral citation, because a subject position can be employed to draw a special attention to the cited authors and because it can break up the writers' own argument by the insertion of cited authors' names in a sentence initial. Thus for writers in the L1 context, a subject position can only be limited to a few papers possibly to show acknowledgements of important contributions to the field. The use of integral citation seems to be more purposeful among those in the L1 context than those in the L2 context. As is the case with citation shown in studies in citation analysis (Budd, 1999; Cronin, 1998; Shadish et al. 1995; Wang & White, 1999; White 2004), citation forms could work as a rhetorical device to acknowledge previous studies and to persuade the readers.

In this case, L2 writers seem to be less skillful in how to cite papers in integral citation. This is because their dominant use of a subject position shows their lack of awareness of the role of a subject position.

Although the data were rather small in this study, the analysis shows that citation forms were employed for some purposes and the writers' motivation of the use of integral citation reflects use of citation conducted in citation analysis.

Choice of integral citation is made at a sentence level but the decision can influence the writers' attempt to persuade readers in a text. Thus although a difference in the use of integral citation between writers in the L1 & L2 contexts can be the one at a sentence level, the consequence seems to be related to the construction of persuasive argument at a discourse level.

Novice researchers often learn about the role of citation but may not be too aware of the use of citation forms to persuade readers. Thus based on the findings of this study, it would be useful to show them that citation forms are purposeful; integral citation can be employed to highlight important previous studies but attention needs to be retained to the writers' work in an academic text. For this purpose, use of integral citation should be limited and if employed, its use in a subject position needs to be reserved only for specific papers that the writers find necessary to emphasize and acknowledge as an important contribution to the field.

Finally, of course, more studies would be useful as the data in this study is rather small. For future study, it would be interesting to analyze academic texts with quotations in social science and humanities. Furthermore, to better understand academic discourse it may be necessary to integrate the results of this study with data on reporting verbs and the use of tense in academic texts.

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Appendix
Names of the international journals analysed
Physical Review A
Physical Review B
Journal of the American Chemical Society
The Plant Cell
Plant Physiology