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Abstract: In his article, "How is a Genre Created? Five Combinatory Hypotheses," Johan F. Hoorn discusses that in genre theory, the creation of a genre is usually envisioned as a complex selection procedure in which several factors play an equivocal role. First, he advances that genre usually is investigated at the level of the phenomenon. For instance, questions may drawn on the effects of social status, education, or "intrinsic values" on forming a genre, on an author's decision with regard to in which genre to express his/her creativity. Second, Hoorn attempts to formulate a general mechanism that explains the forming of groups of genres. His hypotheses of genre formation includes the notion that if one hypothesis fails, the next would come into operation. Hoorn's proposal includes the notion of how to construct and to employ set theoretical and combinatory principles for word-frequency distributions as a mathematical representation of human behavior in the selection process of genre formation. Because the five hypotheses are strictly quantitative and not dependent on particular factors, they are open to testing under any experimental condition.

Johan F. HOORN

How is a Genre Created? Five Combinatory Hypotheses

In the empirical study of literature, the "inherent" qualities of a work are not much in evidence to explain the text's levels of interpretation and classification. The meaning of a book is, supposedly, a construction of readers and genre labeling in a process of concept-driven activity. However, in this process prior knowledge about the writer's work and the need of librarians to organize available space appears to be more important than the indications one can construe from the work itself (see Van Rees 140). True as this may be, I advance the idea that despite the variability of the reader's construction of meaning, readers can also find common ground. They can decide to categorize the same books in the same way on the basis of word-frequency distributions, that is, the number of times a word is mentioned in a book. For example, in novels of romance, the word "love" will be mentioned more often than in handbooks for car repair. Taking this basic approach, I attempt here to revive the traditional idea that data-driven processes can contribute to genre identification and -- as a new notion and proposition -- that the said processes can rely on combinatory principles of word-frequency distributions.

The Phenomenological Study of Genre

Although word-frequency distributions are the main focus of the combinatory approach to genre theory, this does not mean that other phenomena are unimportant to genre identification (see the variables discussed in Holmes; De Nooy; Hanauer; Bortolussi and Dixon; Mealand; Zubarev, <http://docs.lib.purdue.edu/clcweb/vol1/iss1/2/>). It appears that, for instance, the Nigerian village novel has a strong mythic structure of five stages: Traditional order; disturbance from the West; attempted restoration; climax; and disintegration and reorganization (see Griswold; for an elaboration of these stages see below). In consequence, I argue that combinatory genre theory and the proposition of word-frequency distribution may be the only criterion that is necessary for the identification of a genre and thus word frequencies can be used successfully as an indicator of genre. For example, David Mealand shows that among a diversity of linguistic variables, high-frequency words are the best discriminators in computer-aided classification of genre. D.I. Holmes states that "The advantage .... is that the measurement is independent of context and thus can be applied to works on completely different subjects, the information revealing something about the attitude of an author towards rare words and a diversified vocabulary" (335-36). To return to the example of African village novels, Wendy Griswold reports that "only about 20% of Nigerian novels have village settings; the vast majority of Nigerian novels (71%) are set in cities" (578). In other words, the village novel may be called a subgenre of the Nigerian novel because of the high-frequent occurrence of references of various types to villages in these books. Griswold further describes how by overrepresentation of novels with village settings in their catalogues, British publishers themselves defined the Nigerian village novel, rather than the Nigerian authors or readers (580-81).

Thus, by offering a vast number of novels with a high-frequent occurrence of Nigerian village settings, British publishers managed to create a new subgenre. Even the mythic structure of the village novel perhaps may be largely based on word-frequency effects: "Literary elites interpret fiction the way everyone else does: through the generation of a string of associations and remindings" (Griswold 581). Thus, the mythic structure may be the sediment of more or less equal associations and remindings evoked by certain text elements (words) in the minds of the village novel readers. For instance, the stage of Traditional Order depicts conflicts, tensions, and rivalries among villagers while the social order is in harmony with natural and/or spiritual forces; Disturbance from the West introduces Western characters, modernization, urbanization, Christianity, colonialist politics, trade expansion, youth educated by and travelling through the West; Attempted Restoration shows elders trying to preserve the past; Climax contains a clash between progressive and conservative forces; and Disintegration and Reorganization pertains to a new social order and less stability (Griswold 576-77). Every stage in the mythic structure is defined by a set of more or less fixed elements. These may come in many forms: A war reporter, a missionary, a visiting Dutch minister of foreign affairs, etc., but each activates associations and

remindings in the reader's mind which have shared elements of associations within themselves, such as Western interference, for example. The same goes for the other stages: In Attempted Restoration, the frequency of occurrence of elders who want to save tradition is probably substantially higher than youth studying neuropsychology in the West. Ghosts and witch doctors should be high-frequent in Traditional Order, whereas they should be low-frequent in Disintegration and Reorganization, which, rather, contains more brain surgeons and family doctors. The structure of a genre, then, can be understood as the fixed order of fixed sets of high-frequency text elements (i.e., words) with large numbers of approximately equal associations within the set. Hence, by equality is not meant absolute identity, but approximate equality (for the criteria of "equality" between associations, see Hoorn 140-48).

If the frequency of occurrence can constitute the identification of genre and genre structure, then what is the role of the prototypical work in the genre, one that is supposed to have inspired all its followers and imitators? Griswold shows that in 1958, when Achebe's *Things Fall Apart* appeared, a trend was set for a host of writers to create village novels (578). This is based on the assumption that *Things Fall Apart* served as the prototype against which all other novels were measured. True as this may be, when *Things Fall Apart* first appeared it did not form a (sub)genre on its own. It might have been an eminent example, but could become prototypical only after comparison with its followers and opponents. Thus, the prototypical work is a qualification ad hoc but not a priori. The prototype problem lies in the commonly found Platonic perspective on genre.

Platonic, Aristotelian, and Mechanistic Notions of Genre

Genre may be approached from a Platonic perspective. Readers of a book or spectators of a play have an abstract idea about the prototypical work in the genre; a work that contains basic elements and that are shared by all the works in the set (see Leech; Van Peer, 1986, 1990; Swales; Freedman and Medway; Hanauer). The prototype "is not only well defined, it is also maximally distinct from the prototypes of other categories and classifications" (Piters and Stokmans, poster presentation). If a work shares sufficient basic elements with the ideal, that is, the prototype, it then belongs to the genre in question. In line with most Platonic approaches, the genre-by-prototype theory is non-dynamic. It assumes basic elements that are prestored in the mind. How the basic elements take shape and why exactly these and not other elements form the prototype remains unresolved. How did the first readers of Achebe's masterpiece know that it would launch a complete subgenre? They did not and therefore they could not have formed an idea of the prototypical Nigerian village novel until they experienced more data, that is, they had read many more novels with village settings and a mythical structure. Genre-by-prototype does not explain how a genre evolves through the ages: For example, the changing meaning of the novel through the romantic and postmodern periods. As a psychological theory, it assumes a concept-driven subject, who is hardly affected by data-driven processes. The idea of genre-by-prototype stems from the classic psychological assumption that the prototype shares most elements with the members in the category and the fewest with members of other categories (see, e.g., Rosch and Mervis). However, G.L Murphy and D.L Medin and recently Yeshayahu Shen argue that shared sets of unspecific elements do not account for the classification data they found, and Shen asks: "Which properties are more central to the grouping?" (10). Murphy and Medin suggest that subjects classify on the basis of elements that activate many relations (causal relations and inferences), rather than elements without such relations. In the line of Aristotle's analogy-view on metaphor (see Halliwell), Shen infers that similarity which is established by causal and explanatory relations will be preferred over similarity by isolated elements. When applied to genre theory, those books are grouped together with words that share many causal and explanatory relations (within and between books). The prototypical book would have words that share most relations with words of other books in the genre and fewest with words of those outside. Yet, what is the rule that regulates the number of relations necessary to establish similarity? Which relation-frequency distribution leads to what classification? The similarity-by-relation (i.e., genre-by-relation) approach is not parsimonious. Words would not only activate associations in the subject's mind, subjects also would always have to infer and relate them together before similarity can be perceived. Thus, the subject is a concept-driven entity, insensitive to stimulus-based effects. The

question, therefore, is how a genre is created in the mind? Can a literary novice successfully classify works of art in the right genre, without knowledge of the current genres in a given community? Can it do so without complex inferences or perhaps even without focusing on shared sets between words or books? Is it possible to formulate certain stimulus-based rules, determining which works of art are classified together as a genre or subgenre?

Following E.J. Dijksterhuis's work, I propose that in contrast to the Platonic view or the Aristotelian analogy view, the combinatory approach to genre has a more mechanistic nature. The combinatory approach stresses the importance of the stimulus and of the audience's (reader, viewer, spectator) who is subject to general mathematical rules from which genre, genre formation, and prototype follow automatically. While the present study sees word-frequency distributions as the source of information responsible for genre formation and attribution, its regulating system is combination theory. Before combination theory can be applied to word-frequency distributions, however, genre theory should be treated as an instance of set theory (set theory is a branch of mathematics that deals with relations between sets).

Genre and Genre Formation as Based on Principles of Set Theory

First, I present a proposal for genre theory as an example of set theory: A genre is a set of books that may be divided into several subgenres. A subgenre is a set of books that may be divided into several subsubgenre, etc. A book is a set of words. Each word evokes a set of associations. The subgenre ought to have a certain mutual similarity to belong to the genre. The books ought to have a certain mutual similarity to belong to the subgenre. To a certain degree, the words that establish this similarity ought to evoke equal associations. Broadly speaking, a genre is established by the equal associations that the words evoke in a set of books (including cover text, title, and author's name). Note that the proper mathematical term for set would actually be "tuple" because an element is allowed to occur more than once in the set. The subgenres are contained in or intersect with the genre. The books are contained in or intersect with the subgenre. The words are contained in the book. The associations are contained in the word. Associations can be equal or unequal (the dichotomy is too crude: There may be fluid boundaries). Equal associations form shared sets, which make words look similar. Unequal words form distinctive sets, making words more dissimilar. Words that only evoke equal associations and not unequal ones are perceived as similar words (perhaps even tautological or identical). Words that only evoke unequal associations and not equal ones are perceived as dissimilar words. Inbetween, a continuum stretches out in which the relation (e.g., the ratio) between the shared and distinctive sets of associations determines whether words are similar or dissimilar. In classical set theory, calculating a ratio between two sets or estimating probabilities for shared and distinctive elements would violate Kolmogorov's axioms (Wojtek Kowalczyk, Vrije University, personal communication 12 May 1998). A solution may be found in the work of H.-J. Zimmermann (16) and it is discussed in more detail in Johan F. Hoorn and Elly A. Konijn (2000a, 2000b). The perception of this relation (e.g., the ratio) may fluctuate if associations in one of the sets is weighted heavier by the subject.

When is a set of books called a genre? Books form a genre when, according to their readers, they contain a sufficient number of similar words to take them together as a group in contrast to books that do not have a sufficient number of those similar words. What words are we talking about, then? About those content words (nouns, adjectives, verbs, proper names) that are not necessarily spelled equally, but that do necessarily evoke shared sets of equal associations (the war reporter, the missionary, the visiting Dutch minister of foreign affairs, etc.). In this respect, one can also think of associations that describe a similar concept, such as "potential of the protagonist," "ability to develop," "structure," "form," and "content," tools Vera Zubarev uses to describe genre with in her paper "The Comic in Literature as a General Systems Phenomenon": <http://docs.lib.purdue.edu/clcweb/vol1/iss1/2/>. Further, J.F. Burrows shows that the frequencies of function words even may discriminate among genres. Thus, similar words are not only spelling variants but also words of/with different content with many equal associations. By focusing on the "equality" of associations and not of words, the effects of context are taken into consideration, synonyms are equalized, and homonyms are sidelined. Envision genre, then, as an abstraction formed from a set of books, in which, in principle, the words are represented in

random numbers. The way in which the words are distributed over books may indicate their genre-specific value. When particular words occur frequently in particular books, and seldom in other books, this may be considered a feature that is typical of the genre. Such words may refer to the main protagonist, for example (see Zubarev's definition of the dramatic genre: <http://docs.lib.purdue.edu/clcweb/vol1/iss1/2/>). Accordingly, the picaresque novel will contain many rascals and only a few shepherds and pastoral poetry will contain many shepherds and only a few space crafts. Thus, a frequency number greater than 1 indicates that there are similar words within and/or between the books. The prototypical book in the genre, then, is more a result of the word-frequency distributions and the consequential genre classifications than the impetus to such a classification. The prototype is merely the one work with words that share most associations with the words of most books in the genre and fewest with words of books in another genre. Thus, it contains the highest number of similar words -- perhaps in relation to the number of dissimilar words -- in the set of books that forms the genre. The prototype may change with books and readers being added to or deleted from the reading population.

Genre Formation and Combination Theory
Suppose a sample of books that are suspected to belong to the same genre because a particular word is found frequently in the texts of these books. In an ideal situation, the books in the genre are equally large and contain equal numbers of words with equally high frequencies of occurrence. The set of the genre, then, contains **k** words with an equally high frequency. In a non-ideal situation, the size of the book should be corrected. One way would be to take the book with the fewest words and use it to reduce the text to similar text size in every other book. However, if the high-frequency words are not equally distributed in the text, crucial information is lost. More sophisticated is the method advanced by Charles Muller and extended by D.I. Holmes who scaled down the text size without the loss of information on the word-frequency distributions. Across all books, the sum of frequencies of occurrence should be determined for every word, from which a rank ordering of words emerges. The analysis should take place for each word with a frequency number greater than 1, starting out with the highest frequency word. For the sake of argument, suppose that the word "shepherd" has a frequency of occurrence of 60 times in four books. With this information, there are two ways to proceed: The first is to randomly draw equally large samples from these 60 similar words and to administer in which book each word per sample was found, for instance 20 samples of three words. If the frequency numbers are not high enough to allow for sampling from one similar word, the procedure could then be executed with, for instance, 20 words of the same frequency number (e.g., "rascal" = 3, "shepherd" = 3, etc.). This second way to proceed is more complex. To decide that the books belong to the same genre takes the extra constraint that each word occurs at least once in each book *together* with each of the other words of the same frequency number. To avoid unnecessary complication, only the first option will be pursued here. The combinatory analysis following next is based on D. Neeleman and J. van Bolhuis (20-22). It comprises a brief introduction of certain combinatory principles.

   After equalizing the number of words per book, the set size of the genre can be divided into *n* equally large books. If the frequency of occurrence of shepherd in the *i*-th book is defined by ki, then the following is valid: $ki, k1 + k2 + ... + kn = k$. The *n*-number ($k1, k2, ... , kn$) is the word-frequency distribution of shepherd over books in the genre. The question is how many different choices can be made if every word that contributes to the high frequency of occurrence of shepherd may be chosen more than once, but the order is unimportant? In other words, *k* books (for the *k* words) should be chosen from the *n* books, including repetitions, but disregarding the order. The total number of word-frequency distributions *T* then equals:

$$T = \begin{bmatrix} n + k - 1 \\ k \end{bmatrix}$$

For the division in subgenre, the *n* books should be understood as *N* larger units. Suppose that *lj* is the frequency of occurrence of shepherd in the *j*-th subgenre. In that case is $l1 + l2 + ... , + lN = l$. The *N*-number ($l1 , l2 , ... , lN$) is the word-frequency distribution of shepherd over the subgenre

in the genre. How are we to determine the number of word-frequency distributions over books that obtains one particular word-frequency distribution over subgenre? The *j*-th subgenre contains *lj* times the word shepherd and *n/N* books. The number of ways to distribute these *lj* words over the *n/N* books is:

$$T_j = \begin{bmatrix} n/N + l_j - 1 \\ l_j \end{bmatrix}$$

Further, Leibniz's rule of production states that the number of word-frequency distributions over books that obtains one particular word-frequency distribution over subgenre equals *T1 × T2 × T3 × ... × TN.* It goes without saying that the above may be repeated for every other similar (and thus, high-frequency) word (e.g., space craft, goblin, or rose). The sum of distributions of all -- for the text sample -- high-frequency words may decide which book belongs more or less to which (sub)genre, and on what grounds (i.e., what words).

Here is an example of genre formation based on one high-frequency word. In an adaptation from Neeleman and Van Bolhuis (21), the word-frequency distributions of 20 samples of three from the word "shepherd" with a frequency of occurrence of 60 times in four books are given below. It is an example of (sub)genre formation by analyzing 20 samples of three (the rows) from a word with a frequency of occurrence of 60. From this constellation, two subgenres of two books each follow automatically.

book	I	II	III	IV	book subgenre I and II	book III and IV
word-freqcy	3	0	0	0		
distributions	0	3	0	0	3	0
	2	1	0	0		
A	1	2	0	0		
	2	0	1	0		
	2	0	0	1		
	0	2	1	0	2	1
	0	2	0	1		
	1	1	1	0		
B	1	1	0	1		
	1	0	2	0		
	1	0	0	2		
	0	1	2	0	1	2
	0	1	0	2		
	1	0	1	1		
C	0	1	1	1		
	0	0	3	0		
	0	0	0	3	0	3
	0	0	2	1		
D	0	0	1	2		

The above tables display an ideal distribution of the word "shepherd" over the four books. Each distribution has an equal chance to occur, and therefore, the word will probably be considered genre specific. Certain derivations of the word, such as ("space shepherds," "shepherd rascals," or

"Arcadian shepherds") may indicate a subgenre (see Zubarev's new typology of pure and mixed types of the dramatic genre based on the (mixed) features of the main protagonists: <http://docs.lib.purdue.edu/clcweb/vol1/iss1/2/>). The distributions in the fields A and D show clear cases of a subgenre. The fields B and C give the words that are unspecific for a subgenre. If the rows are not filled by equal samples from one high-frequency word but by many words with the same frequencies, then the (sub)genre-specific value of the various words may be even more convincing. From the word-frequency distributions, the following genre hypotheses can be deduced:

Genre hypothesis 1: If the distributions of a randomly chosen high-frequency word over a randomly chosen set of books have an equal chance of occurrence, then those books belong to the same genre, and the word is genre specific.

Genre hypothesis 2: Subgenres follow automatically from an ideal word-frequency distribution over books by distributing in all possible ways the lj words over the n/N books.

Genre hypothesis 3: In cases that similar words are only found in different books, a genre is established in the mind if there are distributions over books, since k distributions (for the k words) ought to be chosen from n, without repetition and disregarding the order. To illustrate Genre Hypothesis 3, the following four word-frequency distributions should be found to establish a genre:

book	I	II	III	IV
word-freqency	1	1	1	0
distribution	1	1	0	1
	1	0	1	1
	0	1	1	1

Genre hypothesis 4: If it is assumed that in evoking distinctive associations, words can never be considered similar, yet, that Genre Hypothesis 3 is not valid (the words are in the same book), then a genre is created if there are *n to the power of k* distributions over books. Genre Hypothesis 4 claims that "shepherd rascals" (*r*) are something different than "space-shepherds" (*s*) and "Arcadian shepherds" (*a*), so that the word-frequency distribution for a range of pastoral novels:

book	I	II	III	IV
	1_r	1_s	1_a	0

is something different than:

book	I	II	III	IV
	1_a	1_r	1_s	0

The "Arcadian" and "space shepherd" in book III in the word-frequency distribution below are not distinguishable for Genre Hypothesis 1:

book	I	II	III	IV
	0	1	2	0

They are, however, for Genre Hypothesis 4:

book	I	II	III	IV
	0	1_r	$2_{a,s}$	0

Genre Hypothesis 5: If Genre Hypotheses 3 and 4 are simultaneously valid -- in other words, if similar words are never in the same book and are assumed never to be entirely similar -- a genre is created if there are $n!/(n-k)!$ distributions over books (without repetition, but regarding the order).

Discussion

The combinatory approach does not pretend to provide a holistic vision on genre nor does it consider the effects of the (literary) systems outside the text (see Zubarev, <http://docs.lib.purdue.edu/clcweb/vol1/iss1/2/>). The five genre hypotheses merely describe the

way texts supposedly are organized into groups at the level of words. This means that they are not valid on the level of, for example, verse form. Sonnets are easily distinguished from rondeaux on the basis of their rhyme pattern, not necessarily based on word frequency. Yet, to figure out the difference between a text sample from detective novel and from psychological thrillers is a different task. Readers likely pick up the way word frequencies are organized thus resulting in the genre labeling. Therefore, they are not only literary but also psychological hypotheses which play a role in genre formation. The latter suggestion, however, must first be empirically tested. For the investigation of literary texts, computer analyses of the word-frequency distributions should corroborate the traditional classification of a set of books. The test input should be a mix of clear-cut and doubtful cases. On the basis of the five hypotheses proposed here, it should be possible to develop a method that would allow the classification of each book into a traditional (sub)genre. To obtain more similar words and to gain firmer empirical ground, feature elicitation or association generation tests could be performed with subjects by employing the content words as stimuli (see Hoorn 115-225). The content words with large shared sets should yield higher similarity ratings, indicating which words may be considered similar words, and should be analyzed accordingly. Another method could be to present computer analyses to reader subjects, asking them to improve the score. If they fail to correctly classify more books than the computer already did, the genre hypotheses would prove tenable. Reversely, the program could use judgments of human experts as additional variables, and if its score improves, the genre hypotheses would prove little more than some explanatory value.

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