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Abstract

Perceptual processes generally enhance borders, because of their high information value. Mach bands are an example in vision. In the social world, borders are also of special significance; one side of a border is generally more esteemed or valued than the other. We claim that entities (individuals, groups) that are just over the border on the positive side tend to exaggerate their membership on the positive side (asymmetrical social Mach bands). We demonstrate this by showing that (a) master's-degree universities use the word *university* to describe themselves more than major graduate universities do, (b) small international airports use the word *international* to describe themselves more than major airports do, and (c) University of Pennsylvania students, who are affiliated with a “marginal” Ivy League school, use the word *Ivy* to describe their school more than Harvard students do.

Keywords

social, borders, enhancement, groups, open data

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For almost 100 years, psychology as a discipline has been jockeying to be classified as a natural science. The natural sciences are often viewed as more prestigious and more advanced than the social sciences, and psychologists have strived to be viewed as “baby” natural scientists rather than the most “scientific” social scientists. In recent decades, psychology has appended the word *science* to itself (*psychological science*) and to former subareas that have now become departments (e.g., *cognitive science*, *neuroscience*). This trend in nomenclature is also illustrated in the names of several relatively new journals in psychology: *Social Psychological and Personality Science*, *Perspectives on Psychological Science*, *Current Directions in Psychological Science*, and *Clinical Psychological Science*. And unlike textbooks in more secure natural sciences, introductory psychology textbooks usually include a section on what science is and what the scientific method is, implicitly or explicitly claiming that psychology is a (natural) science.¹ We think psychologists are defending their belief that psychology is properly categorized as a natural science;

in contrast, physicists, biologists, and chemists, who are more firmly placed in the natural sciences, rarely feel compelled to defend their disciplines as natural sciences.

This phenomenon is an instance of a general social phenomenon: the tendency for border or marginal members of positively valenced groups to emphasize their membership in those groups. We call this tendency to emphasize membership at a positively valenced border the tendency to create *asymmetrical social Mach bands*, and ground this social phenomenon in some basic perceptual science. Borders are sources of particularly rich and useful information, and perceptual systems enhance them. Thus, in the visual system, at the border between a uniformly dark and uniformly light patch, the area perceived to be brightest is just over the border on the more illuminated side, whereas the area perceived to be darkest is just

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over the border on the darker side. The effect of these Mach bands (Ratcliff, 1965) is to accentuate borders.

Social Mach bands also serve to accentuate borders, but they depart in character from visual Mach bands in that they are often asymmetrical. Social categories are almost always valenced, so that one side of a social border is more esteemed than the other. Asymmetrical social Mach bands arise as individuals, institutions, or other social entities create, maintain, and broadcast social identities—identities derived from group membership (Tajfel & Turner, 1979). We propose that individuals who are in a favored group near the group's boundary emphasize their presence on the favored side of that boundary. Individuals generally prefer to be in higher-status or more positively valenced groups, both to enhance their self-esteem and to project a more impressive self to others (Hogg & Abrams, 1988; Tajfel & Turner, 1979). We assume that the same holds true for institutions and other groups.

Asymmetrical social Mach bands are also present in the domain of sociolinguistics. Labov (1972) showed that in formal speech, middle-class speakers of American English, compared with both lower- and upper-class speakers, demonstrate more precise and careful pronunciation of the dialect associated with educated and high-socioeconomic-status English speakers. This phenomenon is known as *hypercorrection*. By using hypercorrected pronunciation borrowed from the upper social classes, speakers on the border between upper and lower classes emphasize their membership in the upper classes.

In the domain of intergroup attitudes, research by White and her colleagues explored the related phenomenon of horizontal hostility (White & Langer, 1999; White, Schmitt, & Langer, 2006). They demonstrated that members of "extreme" minority groups, who are often proud of their distinction, show more negative attitudes toward bordering, but less extreme, minority groups than toward majority groups. Thus, Greek Communists are more hostile toward Greek Progressive party members than toward Greek Conservatives, members of varsity teams are more hostile toward members of junior-varsity teams than toward members of intramural teams, and conservative Jews are more hostile toward reform Jews than toward nonpracticing Jews. This excellent work by White and her colleagues served as a model for the present work, because they described a phenomenon and then established its generality by showing that it is manifest in a wide range of contexts. Here, we demonstrate the phenomenon of asymmetrical social Mach bands by showing that marginal members of three groups (universities, international airports, and the Ivy League) emphasize their group membership more than do secure, quintessential members of the relevant groups.

Study 1

Technically, any school of higher education that offers at least one postbaccalaureate degree is a university (as opposed to a college). We presume that it is prestigious to be a university, and that institutions at the border of the university category (i.e., those with few or no Ph.D. programs) put greater emphasis on their status as a university compared with schools that have more substantial higher-degree programs.

Method

Listings of the top national universities and the top master's universities in the United States in 2012 were taken from U.S. News & World Report (2012b, 2012c). According to U.S. News, the 280 listed national universities "offer a full range of undergraduate majors, master's, and doctoral degrees," whereas the 626 listed master's universities (called regional universities) "offer a full range of undergrad programs and some master's programs but few doctoral programs" (U.S. News & World Report, 2012a). To be included in our sample, a university had to meet the following criteria: First, its formal name had to include *University*. Second, its names could not include a location (e.g., "state," "Michigan"). Universities with names including locations, such as "University of Michigan," are less likely than others to refer to themselves in an abbreviated form, such as "Michigan," because the abbreviated form is ambiguous and could be naming the location (the state of Michigan) or the university (the University of Michigan). Third, the university had to have an "About Us" Web page where the university was referenced in the text at least once.

Two undergraduate judges blind to our hypotheses coded the "About Us" Web pages for the 55 national universities and 151 master's universities included in our final sample. Each self-reference of the specific university was categorized as either a "university mention" (e.g., "Harvard University" or "the University") or an "other mention" (e.g., "Harvard"). Acronyms (e.g., "SMU") were excluded,² as were other uses of the word *university* not in reference to the specific institution. For each university's Web page, the percentage of self-references that included the word *university* was calculated. The judges' ratings were highly reliable (intra-class correlation coefficient, or ICC = .99).

Results

Universities at the border of the university category emphasized their university identity more than archetypal universities did. On average, master's universities used the word *university* in 62.2% of self-references ($SD = 31.6\%$, $n = 151$), whereas the corresponding mean

for national universities was 46.4% ($SD = 31.0\%$, $n = 55$), $t(204) = 3.19$, $p = .002$, 95% confidence interval (CI) for the difference = [6.0%, 25.5%], $d = 0.50$.

Study 2

We presume that airports that offer international flights are in a higher-status category than airports that offer only domestic flights. International airports in the United States differ substantially in the number of international flights offered—ranging from a single route to Canada to dozens of international flights per day. We hypothesized that small international airports emphasize their status as international airports more than large ones do.

Method

A list of airports in the United States was obtained from the Web site of the Federal Aviation Administration, or FAA (2013). We limited our sample to the 96 airports with *International* in their formal title and an “About Us” Web page (in English) that included at least one self-reference. The FAA Web site provided the total number of enplanements for each airport in the 2012 calendar year and classified each airport as a nonhub ($n = 23$), small hub ($n = 34$), medium hub ($n = 19$), or large hub ($n = 20$). We compared small hubs with large hubs. As a robustness check, we also examined how airports’ self-references differed as a function of the total number of enplanements.

Two undergraduate judges, blind to our hypotheses, coded the “About Us” Web page for each airport. Each self-reference of the specific airport was categorized as either an “international mention” (e.g., “Philadelphia International Airport” or “Philadelphia International”) or an “other mention” (e.g., “Philadelphia Airport” or “Philadelphia,” as in “Philadelphia has four runways”). Official acronyms (e.g., “PHL”) were excluded,³ as were nonspecific uses of the word *airport*. For each airport’s Web page, the percentage of self-references that included the word *international* was calculated. The judges’ ratings were highly reliable ($ICC = .97$).

Results

Small ($n = 34$) airports were more likely to emphasize their status as an international airport than large airports were ($n = 20$). On average, small airports used the word *international* in 68.2% ($SD = 30.3\%$) of self-references, whereas the corresponding mean for large airports was 31.4% ($SD = 29.1\%$), $t(52) = 4.38$, $p < .001$, 95% CI for the difference = [20.0%, 53.8%], $d = 1.24$. To ensure that our results were not due to the way the FAA categorizes small and large airports, we examined whether larger international airports (i.e., airports with a larger number of annual enplanements) were less

likely to use *international* in self-references. We found that they were: More enplanements in the 2012 calendar year correlated with less frequent use of *international* in self-references, $r(94) = -.331$, $p = .001$.

Study 3

We presume that membership in the Ivy League represents high status and is positively valenced. Pilot studies showed that the University of Pennsylvania (Penn) is not widely recognized as an Ivy university, whereas Harvard is a quintessential Ivy. Of a sample of 204 American participants recruited from Amazon’s Mechanical Turk, 83 (40.7%) mentioned Harvard in free-association responses to “Ivy League,” whereas only 3 (1.5%) mentioned the University of Pennsylvania, $\chi^2(1, N = 204) = 78.01$, $p < .001$. We investigated whether students at the University of Pennsylvania are more likely to think of the phrase *Ivy League* in association with their school than students at Harvard University are. Moreover, we investigated whether this social-Mach-band effect would be present in communicative, impression-management contexts only or in both private and communicative contexts. From a social identity approach, one might predict these effects to occur in both communicative and private contexts. When individuals construct, maintain, and broadcast identities, their social identities from group membership provide integral knowledge and emotional value (Tajfel & Turner 1979). Self-categorization and social identity construction change how people perceive themselves and others (Hogg & Abrams, 1988; Tajfel & Turner, 1979).

Method

A total of 54 Harvard and 53 Penn students participated in the study. We employed a 2 (university: Harvard, Penn) \times 2 (context: private, public) between-subjects, full-factorial design. Two female research assistants at each institution asked undergraduates leaving introductory psychology lectures in the spring 2012 semester and social psychology lectures in the fall 2012 semester to fill out a psychology research survey. Participants were presented with one of two forms that requested, “Please write down 7 things you think of [when you think of your university/when you describe your university to other people]. You may write in words or phrases” (emphasis in original). At random, half the participants received the private-context (“think of”) form, and half received the public-context (“describe”) form.

Results

Penn students were more likely to mention “Ivy League” or “Ivy” in describing their university than Harvard students were, but directing individuals to answer in a

public context, if anything, decreased “Ivy” mentions. In the public condition, none of 30 Harvard students mentioned “Ivy,” whereas 9 of 33 Penn students (27.3%) did. In the private condition, 4 of 24 Harvard students (16.7%) mentioned “Ivy,” whereas 7 of 20 Penn students (35%) did.

In a binomial logistic regression model with Firth bias correction,⁴ being a Penn student (rather than a Harvard student) predicted higher probability of mentioning “Ivy” ($\beta = 3.16, p = .001$), and private context increased the probability of mentioning “Ivy” ($\beta = 2.59, p = .03$). There was also a marginally significant interaction such that Penn students were less affected by being in a private context than Harvard students were ($\beta = -2.23, p = .1$). We also conducted Pearson’s chi-square tests with a Yates continuity correction. A test collapsing across the two contexts revealed that Penn students were more likely to mention “Ivy” than Harvard students were (4 of 54 Harvard students and 16 of 53 Penn students mentioned “Ivy”), $\chi^2(1, N = 107) = 7.70, p = .006$, 95% CI for the difference = [6.7%, 38.8%], but a test collapsing across universities indicated that context (private vs. public) did not affect the frequency of “Ivy” mentions, $\chi^2(1, N = 107) = 1.32, p > .1$, 95% CI for the difference = [-7.0%, 28.1%].

Discussion

We have demonstrated the existence of asymmetrical social Mach bands at one individual and two institutional social borders. We have also presented an initial analysis of the mechanisms by which social Mach bands arise; the results of Study 3 suggest that self-construal is of greater importance than social communication.

We believe that effects like those illustrated here are widespread, although it is sometimes difficult to collect the appropriate data. For example, we believe that the following instances of the asymmetrical social-Mach-band effect are likely to occur: (a) greater display of officer status by lieutenants as opposed to colonels; (b) greater use of doctor titles by osteopaths, dentists, and chiropractors as opposed to medical doctors; (c) greater display of team membership by members of junior-varsity as opposed to varsity teams; (d) greater display of sorority or fraternity membership, or honor-society membership, by new than by continuing members; (e) greater display of wealth by the nouveau riche than by “old money”; and (f) greater display of affiliation with prestigious universities (e.g., jackets) by freshmen than by seniors.

Our results run counter to similarity-attraction theory. Individuals near the border of a highly esteemed group are presumably more similar to marginal out-group members than to individuals at the center of the highly esteemed group, and similarity breeds attraction (Byrne,

1971). Therefore, this theory suggests that border members would deemphasize the boundary to create social bonds to the more similar, and therefore more attractive, out-group members. Such an effect might be expected when the valence difference between the two relevant groups is small or when the positively valenced group feels that its optimal distinctiveness is secure (Brewer, 1991, 2003).

We leave open questions about the relative importance of self-esteem and public-esteem motivations for asymmetrical social Mach bands. We also leave open the importance of a third motivation, uncertainty reduction (an epistemic motivation to understand the self and the social world; Hogg, 2000). We recognize that the contrast between border and central members observed in our data is not necessarily due to marginal members enhancing their border status, but could instead be due to central members deemphasizing their social identity. Finally, we have not actually demonstrated the asymmetry of the social Mach bands; we did not test whether individuals at the border of the less positively valenced group also over-emphasize their membership in that group, compared with members further from the border in that group. Our aim in this set of studies was to identify one feature of group dynamics, link it to a principle in perception, and provide some evidence for its existence and extent.

Author Contributions

P. Rozin developed the study concept, participated in the design of the individual studies, and supervised data collection and analysis. Study 1 was designed by F. Ahn, S. E. Scott, and H. F. Zickgraf. Study 2 was designed by H. Jiang, S. E. Scott, and H. F. Zickgraf. Study 3 was designed by S. E. Scott and H. F. Zickgraf. S. E. Scott and H. F. Zickgraf collected and analyzed the data for all three studies. The manuscript was drafted by P. Rozin, S. E. Scott, and H. F. Zickgraf.

Declaration of Conflicting Interests

The authors declared that they had no conflicts of interest with respect to their authorship or the publication of this article.

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Open Practices



All data and some materials have been made publicly available via Open Science Framework and can be accessed at <https://osf.io/28ejf/>. Some of the materials are not posted because of copyright concerns. The complete Open Practices Disclosure for this article can be found at <http://pss.sagepub.com/content/by/supplemental-data>. This article has received the badge for

Open Data. More information about the Open Practices badges can be found at <https://osf.io/tvyxz/wiki/view/> and <http://pss.sagepub.com/content/25/1/3.full>.

Notes

1. We conducted two pilot studies concerning the frequency of the use of the word *science* in journal titles and department names and mentions of science-related words (e.g., *experiment*, *empirical*) in the indices of introductory textbooks in anthropology, sociology, psychology, biology, chemistry, and physics. Psychology and biology tended to score highest of all disciplines on all three measures.
2. We also conducted an analysis in which acronyms were included as self-references in the “other” category and obtained the same pattern of results as reported here.
3. We also conducted an analysis in which acronyms were included as self-references in the “other” category and obtained the same pattern of results as reported here.
4. We applied Firth’s (1993) bias-reduction method because one of our cells had zero observations, which resulted in an estimation problem of complete separation.

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