2   The Benefits of Diversity and Inclusion

In this chapter we review the benefits of diversity and inclusion for a range of institutional and organizational outcomes. Many people approach the issue of diversity from the standpoint of fairness. For these people, the inclusion of a wide range of people in colleges and universities is required by the institutions' responsibility for fairness: everyone should have the same chance and the same opportunities to excel. This responsibility is a critical part of the commitment to equitable and meritocratic treatment. As a basic good, fairness needs no justification. Thus, for some people, fairness is by itself enough of a reason to achieve diversity because those people assume that excellence is uniformly distributed across different groups. For others, who may think that talent is more likely in some groups than others, an appeal to fairness may not be persuasive.

We think that diversity is not only fair but smart, because diversity promotes excellence. All institutions prize excellence, and so do we. Diversity and inclusion yield benefits that extend in many directions: embracing innovation and creativity, welcoming challenges to received wisdom or traditional knowledge, increasing the visibility of our dedication to the free pursuit of truth, inspiring students to have high aspirations and to explore new ideas, and so on. We review those benefits in this chapter, along with the challenges in bringing about diversity that works.

Leaders are responsible for diversity, and they must solve two puzzles, regardless of the size of the group that they lead. The first is how to overcome the tendency for groups to be homogeneous. The second is how to bring out the best efforts of everyone in the group. This book has a broad conception of leaders. A leader may lead a class, a small group of students, a large lab, a committee, a department, a school, or a university. Whatever form leadership takes, leaders will benefit from knowing what makes groups

work well. The research we present suggests that diversity increases positive outcomes, but only if everyone in the group can contribute his or her best. Leaders affect whether the benefits of diversity will outweigh the costs.

Benefits of Diversity

Demographic Diversity Increases Innovation

Developing and testing new ideas is one of the six "virtues" of ideal academic institutions, and it is at the core of a great deal of scholarship and research. In some fields, with problems that are well-defined by previous knowledge, the goal is clear and there may even be a formula, or algorithmic procedure, for reaching the goal. But for most of the problems that researchers, scholars, and change agents want to solve, it is not clear how to get to the solution. Indeed, it often is not clear how to formulate the problem to begin with. The form and possible content of a solution are also not clear. This is what is meant by calling a problem space ill-defined (Simon, 1973).

Many games, like chess or tic-tac-toe, are examples of well-defined problem spaces. What makes chess hard is not the problem space, but following the chain of the myriad possible outcomes of a given move to decide on the best move. The initial state—the location of the pieces on the board—and the final state—checkmate (or stalemate)—are both known. In addition, the possible moves each piece on the board can make are specified in advance. Players can't devise new moves for pieces.

Most scholarly problems, and problems on a global scale, are not like chess or tic-tac-toe. Is the problem of understanding the origins of modernism, or the causes of the Civil War, or election results, or cancer, one problem or many problems? Is sexual assault in the U.S. military in the same problem space as sexual abuse of children, or are those phenomena only distantly related? Even for a much narrower "academic" question—does bilingualism have cognitive benefits?—the researcher faces an ill-defined problem space. What counts as being bilingual? What counts as a cognitive benefit? Are all cognitive benefits on a par? Is bilingualism only one of many challenging activities that could equally benefit cognition? Setting up the problem is daunting. Achievement of a good statement of the problem, and of a good statement of what the final state should be, helps to structure the problem but does not dictate how to approach the problem.

Diversity—Demographic and Otherwise

Diverse groups *should* produce more innovative solutions and products, given that most problems are ill-defined. If all members of a group specify an ill-defined problem in the same way and come up with similar solutions, they will fail to see other approaches, some of which may be preferable (Hong & Page, 2004; Page, 2007). Having a group of highly trained experts, all of whom look at a problem in a similar way, might seem a priori like the best way to approach a problem, but that will only be true for problems that are already well-defined.

Intellectual diversity is thus highly desirable, though primarily for complex problems (van Dijk, van Engen, & van Knippenberg, 2012). It is possible to achieve diversity of perspective and approach without demographic diversity. A group of White men can have diverse ideas and diverse intellectual backgrounds. People are not clones of each other, no matter how similar their gender, race, ethnicity, class, age, religion, sexual orientation, and education. People differ in their openness to new experiences (a characteristic that is strongly correlated with creativity; McCrae & Greenberg, 2014), their extraversion (another characteristic that is correlated with creativity; Furnham & Bachtiar, 2008), their willingness to challenge received opinion, their ability to stimulate thinking in other people, their fields of knowledge, and so on. Variation in those characteristics contributes to intellectual diversity. Because of the active suppression of women and people of color from academic research until the late twentieth century, the sciences and other fields were primarily populated by White men. The fields nonetheless progressed with innovative approaches to scientific problems.

The important question we address here is whether demographic diversity adds to intellectual diversity (or is valuable for other reasons) or has no positive effect. There is evidence that demographic diversity does contribute to innovation and better ideas (Schiebinger, 2014; van Dijk et al., 2012; see also van Dijk, Meyer, van Engen, & Loyd, 2017). The data are complicated and suggest that a fine-grained analysis of a fairly large range of variables is needed to understand the complex findings, and we review some of them here. From the historical record, we cannot tell whether academic research might have been even more innovative and whether progress would have been faster had women and people of color been working on the problems. We can only make use of the data on innovation in organizations, and those data suggest that the answer is a qualified yes: research in general

benefits from diversity. When we consider restrictions now recognized as ridiculous—such as the exclusion of Jews from physics in Nazi Germany—we can get an idea of what we might be missing by excluding women and people of color.

Just as demographic uniformity does not prevent innovation, demographic diversity does not guarantee it. Demographic diversity does, however, make innovation more likely, and we can understand some of the reasons why. Demographic diversity is a proxy for other types of diverse thinking, and diverse thinking is useful for solving ill-defined problems. Even people who know little or nothing about an area—such as students at the beginning of a course—can ask questions that stimulate instructors to look at a problem in a new light. Experts "know" what questions to ask and thus tend to stay within established outlines. Diversity yields intellectual and creative benefits not because people reason differently as a function of their sex or race, but because their somewhat different interests and experiences give rise to different perspectives and ideas. A diverse group increases the likelihood of a range of solutions. In addition, the acceptance of innovations is more likely among a diverse group of people (Østergaard, Timmermans, & Kristinsson, 2011, for educational and gender diversity).

Impact of Diversity in Different Areas

The impact of diversity has been studied more extensively in areas with a focus on problem-solving rather than in areas such as the humanities where many forms of understanding are valued even if they do not lead to new "solutions," but instead to a new appreciation of factors that produced the problem. In these fields, though innovation is highly prized, it takes somewhat different forms than it does in other fields, and it is much less studied by social scientists. One factor producing this outcome is that it is by definition easier to study diversity when research is conducted in groups rather than by solo scholars, and team activities are more common in the social and natural sciences than in the humanities.

Although some social scientific research is aimed at assessing the creativity of artistic products (Joy, 2012) and the contextual factors that increase creativity (Amabile & Pillemer, 2012), the focus has been on individual works of art or the creativity of individuals. We hope that social scientists will turn their attention to studying teams in the arts and humanities and to understanding how a field may function as a proxy "team" with many

different individual scholars contributing to understanding a phenomenon. We need to understand the impact of diversity of perspective within all fields, whether work is designed or studied by individuals or groups.

It is striking that in the arts, where creativity and fresh outlooks are de rigueur, it remains difficult for women and people of color to be seen and heard. A well-known poster from 1987/88 by the Guerrilla Girls lists the "advantages" of being a woman artist, such as working without the pressure of success and not having to undergo the embarrassment of being called a genius. (See http://www.guerrillagirls.com/projects/ for representations of all Guerrilla Girls projects, including a short video on the Guerrilla Girls' *Guide to Behaving Badly*.) The poster was created in the 1980s, but contemporary women artists and artists of color continue to be scarce in exhibitions at major museums (though firm statistics are hard to come by).

According to the National Endowment for the Arts (2011), in 2005–2009, women were almost half of artists (construed broadly) but earned 81% of what men earned. Ironically, exhibitions of Guerrilla Girls posters seem to get more attention than women artists do; even women's protest signs from the Women's March in 2017 are being collected by museums (Ryan, 2017). In 2015 the magazine *ArtNews* put out a list of the 100 most influential people in the international contemporary art world—a list including artists, museum directors, curators, gallery owners, and so on. The list was 68% male and 32% female; 70% White, 16% Asian, 5% African American, and 7% Hispanic; and 51% European (Artsy, 2016). The percentage of Hollywood directors who are female or African American is similarly small. In the same way, writing, directing, producing, and photographing in television has few women and people of color (Lauzen, 2017), with little change over a ten-year period.

Diversity and Innovation

Whether innovations are for solving social or medical problems like cancer or dementia or for more modest problems like developing new products, they are more likely to occur with diverse teams. A survey of 1,775 Danish firms of different sizes examined the roles of gender, age, ethnicity, and education in predicting how innovative a firm would be (Østergaard, Timmermans, & Kristinsson, 2011). An innovation was defined as an "introduction of a new product or service, excluding minor improvements on already existing products and services" (p. 504). Gender diversity was

linked to greater innovation. Ethnicity did not play a role, perhaps because, by U.S. standards, the employees were not very diverse: they came primarily from Nordic countries and other countries in Western Europe. No mention was made of people of color. Subsidiary analyses suggested that neither males nor females should predominate in an organization if the goal is to maximize innovation.

As another example, although women are a small, underrepresented percentage of patent holders (Frietsch, Haller, Funken-Vrohlings, & Grupp, 2009; Hunt, Garant, Herman, & Munroe, 2013; Meng & Shapira, 2010; Rosser, 2009), their presence on a patent team leads to more citations of the patent (Ashcraft & Breitzman, 2007), testifying to the value of mixed-gender teams. Similarly, in the ecological sciences, articles with at least one woman among the coauthors are cited more than male-only articles (Campbell, Mehtani, Dozier, & Rinehart, 2013).

A field study that experimentally examined the role of ethnic diversity found that diverse teams were less likely than homogeneous teams to accept inflated prices in trading (Levine, Apfelbaum, Bernard, Bartelt, Zajac, & Stark, 2014). Diverse teams may make better judgments in part because members of homogeneous groups are more likely to trust each other even when they shouldn't (Levine et al., 2014). That may in turn account for why scientific papers by U.S. researchers show the influence of homophily: Whites (people with "English"-sounding names) tend to collaborate with Whites, and Asians (people with "Asian"-sounding names) tend to collaborate with Asians, more often than a random assortment would predict. Researchers have a closer connection to others with the same ethnicity. Papers with authors of different ethnicities are, however, cited more often than those with similar ethnicities (Freeman & Huang, 2014).

Other data about the benefits of gender diversity for group work provide mixed results. The effects of women on boards of directors have varied from study to study, sometimes being positive, sometimes negative, and sometimes neutral (Carter, D'Souza, Simkins, & Simpson, 2010; Crédit Suisse Research Institute, 2012; Dobbin & Jung, 2011; Triana, Miller, & Trzebiatowski, 2013). A meta-analysis of 146 studies concludes that the presence of women as chief executive officers and board members is weakly positively related to long-term company performance and weakly negatively related to short-term company performance (Jeong & Harrison, 2017).

Effects of the presence of women among management are somewhat more clearly positive, but only for companies that put a premium on innovation (e.g., Dezsö & Ross, 2012; see also Crédit Suisse Research Institute, 2014). Women in Congress deliver more funding to their districts than do men, after various controls are included (Anzia & Berry, 2011), and, when women are in the minority party, they are more effective than their male peers (Volden, Wiseman, & Wittmer, 2013). Finally, and relatedly, some data suggest that women particularly contribute to helping a group work well by contributing a cooperative climate (Bear & Woolley, 2011; Woolley, Chabris, Pentland, Hashmi, & Malone, 2010).

To summarize so far, diverse groups tend to come up with more innovative solutions to problems. One reason is that the group members in diverse groups have a large range of perspectives and approaches. Another reason is that group members *expect* people who are demographically different from them to have different perspectives. They are thus more open to hearing a range of ideas. Perhaps for that reason, when groups of diverse people learn that the members are more alike than different, the result can be counterproductive (Phillips & Loyd, 2006).

Not all innovations succeed. By their nature, innovations and new directions are risky. Stasis, however, is also risky. Some innovations will fail, just as some standard approaches will fail. Innovations might even be expected to fail at a higher rate than standard approaches exactly because their methods and frameworks are less well-established. Innovations are also likely to spark resistance at the outset, before it is clear that they will lead to intellectual or artistic benefits. And to the extent that fields are less ready to accept innovations that come from women and people of color, it will be harder to demonstrate the worth of new approaches. Progress in any field, however, requires innovation, raising the issue of how best to ensure productive innovative efforts.

Demographic Diversity Enlarges, Changes, and Improves Areas of Study

There are direct benefits to knowledge from greater demographic diversity. We offer three examples. The first example is the development of subfields that either did not exist or barely existed before women and people of color entered the discipline. In the field of psychology, for example, work on the ways that social status affects perceptions of others antedated the increase

of women in the field, but the ways that gender affects evaluations were largely ignored until the influx of women into psychology. That work has led to a wide range of subfields: work on identity—how the identity of the observer and the observed shape perceptions; work on what happens when multiple identities are in play; work on cross-national differences in sex disparities in science and math achievement, and the significance of variation. Also in the field of psychology, work on stereotype threat, particularly as it affects African Americans, was introduced by an African American (Steele & Aronson, 1995). There are questions one doesn't think to ask unless one is a member of one or another demographic group.

Equally, scholarship about writers and composers was altered and enhanced by the presence of female, racial-ethnic, and sexual minority scholars in the fields examining their work (Awkward, 1995; Brett, 2006; Hubbs, 2004; Showalter, 1977). Women writers, or African American writers (such as Toni Morrison), or gay composers (such as Benjamin Britten) became better known as a broader diversity of scholars began taking such artists seriously. In history, the role of women, children, and the poor was better and differently understood as women, minority, and working-class-origin scholars more often wrote about the history of past events, events that had previously been written about by a relatively narrowly defined group of men and from a limited perspective (Hewitt, 1969; Lerner, 1971; Pinchbeck, 1930). In addition, some events previously treated as unimportant have been taken up as significant historical subjects by new entrants to the field (e.g., second-wave feminism, Echols, 1989; Rosen, 2000; motherhood, Badinter, 1981; including motherhood and race; Feldstein, 2000).

One acute instance of the neglect of women and minorities, and one that is acutely damaging to science itself, is in medical- and health-related research. Congress passed an act in 1993 directing that research that was funded by the National Institutes of Health (NIH) include women and minorities as participants in health studies. In 2001, NIH updated the policy as follows:

The guidelines ensure that all NIH-funded clinical research will be carried out in a manner sufficient to elicit information about individuals of both sexes/genders and diverse racial and ethnic groups and, particularly in NIH-defined Phase III clinical trials, to examine differential effects on such groups. Since a primary aim of research is to provide scientific evidence leading to a change in health policy or standard of care, it is imperative to determine whether the intervention or therapy

being studied affects women or men or members of minority groups and their sub-populations differently. (NIH, 2001)

It is astounding that an act of Congress was needed to forcefully present the idea that studies of people's health should not be confined to studies of White men's health and White men's reactions to medications.

NIH grant recipients do not always honor their duty to study and report on women (Carnes, Morrissey, & Geller, 2008; Geller, Koch, Pellettieri, & Carnes, 2011). Researchers do not routinely report the sex of cultured cells in cardiovascular studies (Taylor, Vallejo-Giraldo, Schaible, Zakeri, & Miller, 2011), nor do they report sex differences in efficacy of drugs for dementia (Mehta, Rodrigues, Lamba, Wu, Bronskill, Herrmann, Gill, et al. 2017). Researchers do not include minorities at appropriate rates in cancer clinical trials and do not routinely report the results when they are included (Chen, Lara, Dang, Paterniti, & Kelly, 2014), nor do they include women at the appropriate rates (Klein, Schiebinger, Stefanick, Cahill, Danska, De Vries, Kibbe, McCarthy, Mogil, Woodruff, & Zucker, 2015). Failing to include the full range of human variation in studies leads to mistakes (Nielsen, Alegria, Börjeson, Etzkowitz, Falk-Krzesinski, Joshi, Leahy, Smith-Doerr, Woolley, & Schiebinger, 2017).

The authors of the studies pointing out such failures are primarily women and minorities. That is not to say that White men are not involved in pointing out such failures, nor is it to say that women and members of underrepresented minorities do not contribute to such failures. Rather, we are pointing out that the inclusion of a broader range of people is likely to appropriately broaden the areas of inquiry.

The work of women—Ruth Kirschstein and Geraldine Woods—was important in moving NIH to include women and minorities among those studied (Davis, 2011). Ruth Kirschstein was White and Jewish, and Geraldine Woods was African American. As a female Jew applying to every medical school in the United States in 1947, Kirschstein was rejected by all but two, Tulane and New York University. A staff member at one school suggested she change her name to increase her odds of acceptance (Davis, 2011). Both women worked to include women and people of color among reviewers as well as among those studied. Since we do not have access to an alternate universe in which women and people of color were included in positions of authority in academic science and NIH, we cannot know whether their

inclusion would have precluded sex and ethnicity disparities in research from the outset. But it seems likely that a more diverse group would have reduced the extent of disparities in research.

Although research by women and people of color has demonstrated how far medical research still has to go in inclusiveness, we want to avoid creating sharp boundaries related to sex and ethnicity since they may disguise other aspects of variation. There may, for example, be apparent sex differences in response to medications that are actually due to other factors, such as weight, that correlate with gender (Richardson, Reiches, Shattuck-Heidorn, LaBonte, & Consoli, 2015; see also discussion by Schiebinger & Klinge, 2015; Maney, 2016, and other papers in a themed issue on neural sex differences and their significance in *Philosophical Transactions of the Royal Society B, Biological Sciences*, 2016, Volume 371, Issue 1688, compiled and edited by Mary M. McCarthy). Similarly, differences that are on their surface due to race or ethnicity may be due to other factors (Grandner, Williams, Knutson, Roberts, & Jean-Louis, 2016; Roberts, 2013), and conditions may be underdiagnosed for individuals in one or another ethnic group because of beliefs that those conditions only occur or do not occur in "their" group (Yudell, Roberts, DeSalle, & Tishkoff, 2016).

Thus, we see inclusiveness as a goal that is best met by—being inclusive! Women and people of color have been instrumental in opening topics of scholarly discussion and in bringing up the full range of human diversity. The most recent studies referred to above caution against locking human and animal diversity into neat categories.

The second example of how diversity benefits knowledge is more subtle (see, for discussion, Crasnow, Wylie, Bauchspies, & Potter, 2009/2015; Fausto-Sterling, 2012; Schiebinger, 2014; Wylie, 1997). Diversity leads to less reliance on contemporary folk notions of gender and ethnicity differences as guiding metaphors for faulty science. In biology, for example, research on the sex-determining factor and the roles of X and Y chromosomes were initially wrongheaded, seeing the sperm as active and dominant and the egg as passive (Fujimura, 2006; Martin, 1991). Here, science has largely corrected itself, thanks in part to work by scientists who were not in the grip of folk beliefs about gender. But the role of gender schemas is evident in the first theories scientists developed.

Similar examples are the hypothesis that an extra Y chromosome makes males more aggressive and, hence, more likely to be imprisoned for violent

crimes, even though XXY and XYY males have similar incarceration rates (Richardson, 2010, 2012, 2013). Here, too, science corrected itself. However, biologists themselves continue to use metaphors of male "agency" and female "allure" in talking about chromosomes (Richardson, 2012, 2013). In archeology and anthropology, researchers run the risk of projecting pictures of present-day male-female arrangements onto an understanding of the past (Wylie, 1997; see also Hays-Gilpin & Whitley, 1998; Nelson, 2007; Wright, 1996).

Folk notions about gender also continue in claims about differences between male and female brains (see critiques by, among others, Fine, 2010, 2013, 2017; Jordan-Young, 2010). Here, too, we can expect that science will eventually correct itself, and work proposing that the human brain is a mosaic and cannot be definitively categorized as "male" or "female" should help in that effort (Joel, Berman, Tavor, Wexler, Gaber, Stein et al., 2015; Joel & Fausto-Sterling, 2016). Further, the importance of the fact that different brain mechanisms can mediate the same behavioral outcome will be better appreciated (De Vries, 2004; Fausto-Sterling, 2012), as will the role of the environment in mediating and organizing the expression of hormones (see the discussion in Valian, 1998). But while we are waiting for science to correct itself, we can lament the need for it to do so. We can see that the inclusion of a broader diversity of researchers could have headed off some mistaken directions at the outset.

A third example comes from fields that are more remote from gender, such as theoretical mathematics and theoretical physics. Here, the fields may be losing out in two ways—by not including women and underrepresented minority members and by paying too little attention to the subfields—"niches"—where women are more numerous (Wylie, 2012). In the first case, there is an arbitrary restriction of the talent that is capitalized on. Even if one thought that the pool of White men was large and intellectually diverse enough to allow those fields to move forward (an assumption that is increasingly untenable as fewer and fewer U.S.-born White men enter into or stay in math and science fields), any exclusion of half the available pool—in the case of women—or 30% of the available pool—in the case of African Americans and Hispanics—looks foolhardy and wasteful. In the second case, fields that women and minorities are more numerous in can be slighted simply because they are fields that women and minorities are more numerous in. Insights from such fields may be harder to achieve because of lack of support and because the implications of the insights may be insufficiently appreciated.

To make our claims clear: we are *not* saying that only women or people of color will introduce new perspectives or frameworks, even when those perspectives and approaches are linked to gender or ethnicity issues. We *are* saying that any field will maximize new perspectives and approaches by including a demographically diverse group of people. We *are* saying that new ideas should receive constructive, rather than destructive, critiques.

Demographic Diversity Has Broad Benefits for Institutions and Individuals

Better Outcomes for Undergraduate and Graduate Students   An intellectual advantage of a diverse faculty for students is that a diverse range of academic interests will be available. Students will be exposed to a broader range of questions than they would with a demographically limited faculty. Budding interests that students might have in a wide set of areas are more likely to find receptive responses if the faculty are diverse.

Another advantage of a diverse professoriate is the demonstration that there is room in the professions and in academia for aspiring students, regardless of their sex and ethnicity. Young people are unlikely to enter fields where they see no possibility for advancement. Aspirants do not need to see people exactly like them in senior positions and among the faculty, but they do need to see that there is room for them if they are going to continue. One way to demonstrate that there is room is by hiring excellent and diverse faculty. Another way to demonstrate that is by having White male faculty who take an interest in the intellectual development of all students, regardless of gender or race and ethnicity. Being taken seriously and being constructively challenged by a diverse group of faculty makes it clear to students that the field as a whole wants them to be successful.

Although anyone can encourage students to succeed, several pieces of evidence suggest that diversity encourages participation and aspiration. In one study, college men and women who were interested in science saw mock videos of a supposed summer science conference (Murphy, Steele, & Gross, 2007). In one video, the ratio of males to females was 1:1; in the other it was 2:1. Women students who saw the 2:1 video showed heightened physiological vigilance (such as faster heartbeat) and a lower sense of belonging compared to women who saw the 1:1 video. Both groups of female students reported a preference for attending the conference with equal ratios. Men were largely unaffected by the ratios, except that they too

preferred a conference with an even ratio (though not necessarily for the same reasons as women had).

The presence of a variety of social groups in positions of authority should have two effects. First, diversity suggests that there is room for the aspirant: where there is a lot of variety it is plausible to think that there is room for more. Second, and relatedly, diversity will make the roles of English professor, scientist, surgeon, or successful businessperson ones which are not sex or race specific. Diversity in a group makes it easier for everyone to make accurate judgments of the qualifications and value of nontraditional applicants for positions. If you no longer think "male" or "White" when you think "surgeon," an African American female surgeon will not be burdened in your evaluations by being African American and female.

One implication of the importance of cues like the ratio of males to females is the different perspective it provides about *choice*. Individuals do not necessarily freely *choose* to have or not to have certain careers (see, inter alia, Dasgupta, Scircle, & Hunsinger, 2015, for addressing this point). If White men, White women, and people of color are responding to subtle cues about the appropriateness and rightness of their presence in a field, their choices are not the product of a pure preference, but are constrained by cues suggesting that they do or do not belong. Both observers and participants may see choices as the product of preferences, even when the environment has narrowed or directed choice. Preferences and interests are internal states that are affected by external contexts.

We emphasize what we have already indicated: the same holds for White men. To those whose environment supports their aspirations and ambitions, the environment may simply appear neutral rather than supportive. Thus, men, especially White men, look as if they are choosing, and perceive themselves as choosing, to be doctors and mathematicians and scientists, although their choices are also constrained and directed. In the case of females, as we detail in following chapters, the environment with respect to math and science does not support aspirations and ambitions in childhood, where girls are seen as doing well because of effort, even when their standardized test scores are equal to boys'. The subtle cues that high school girls and college women are faced with become all the more important as determinants of "choice."

Although it is helpful to see that people similar to oneself are in the positions one aspires to, the effect of role models can be debilitating as well as

inspiring. If the role model's behavior and achievements seem achievable, then the role model is inspiring (Lockwood & Kunda, 1997, 1999, 2000). If the stars in a field seem to be almost inhumanly talented and hardworking, their existence may instead confirm the impossibility of achievement for an ordinary mortal. In the case of demographic groups that are underrepresented in positions of power and prestige, the presence of an outstanding minority member may serve only to undermine potential aspirants. The person may evaluate the distance between themselves and the star as too great. Since the women and people of color who occupy positions of power and prestige *are* exceptional, both in their numbers and in their achievements, it can seem as if those exceptional qualities are necessary for achievement if one is a woman or person of color. Instead of thinking, "I'm like her, I can do it, too," the person thinks, "I'm not like her, so I probably can't do it."

But when people can identify with those who have achieved success in a field, or see themselves as similarly capable, they are more likely to aspire to that success. In one experiment, college women who were in math classes taught by female instructors had a range of positive outcomes that women in classes with the same content that were taught by men did not have (Stout, Dasgupta, Hunsinger, & McManus, 2011). Women with female instructors increased their interest in and liking for science-related fields and showed greater confidence about their abilities in those fields. Women in the U.S. Air Force Academy prosper in science-related classes when women are instructors, while male students are unaffected (Carrell, Page, & West, 2010). Elementary schoolchildren of color benefit from the presence of teachers of color (Goldhaber, Theobald, & Tien, 2015), and high school students of color receive higher expectations from teachers of color than from White teachers (Gershenson, Holt, & Papageorge, 2016). The data on the beneficial effects of teacher diversity on students of all ages are clear: females and individuals of color benefit in performance and motivation.

Although the notion of a critical mass is too narrow to account for the decisions that women—and men—make about whether to pursue particular careers, the data suggest that a combination of factors, including critical mass and other features of the environment, convey to potential students the extent to which they fit or belong in the discipline (Creamer, 2012; Fox, Sonnert, & Nikiforova, 2009; Sonnert, Fox, & Adkins, 2007). Having women and minority faculty well represented demonstrates to students that they can

belong. Interestingly, even male students are more interested in engineering when female students are more numerous (Creamer, 2012).

All students benefit from diversity, regardless of their eventual field. After students graduate, they will work in a diverse world. The mental flexibility that is necessary for success in that diverse world will be developed in part through experiences with a diverse student body and a diverse group of faculty and administrators. A diverse faculty gives students a head start in learning how to appreciate and interact with a range of coworkers and authority figures.

Improving the Job Applicant Pool   Broad inclusion increases the range and size of any candidate pool: the larger the qualified pool, the greater the choice and the higher the likelihood of finding well-qualified candidates. A few individual institutions might be seen as so desirable as places to work that they can afford to eliminate half their potential talent pool, but most institutions are not in that category, nor is the nation as a whole. It also seems inconsistent to make less of an effort to include women and people of color on the faculty than one makes to include them in the student body. The advantages that women and people of color bring to the student body should extend to the professoriate (Gurin, 2004; Gurin, Dey, Hurtado, & Gurin, 2002). Further, whatever responsibilities institutions have to educate women and people of color should extend to hiring them after educating them.

Why the Composition of Teams Is Important

Increasingly, published work in the sciences (broadly conceived) is pursued by teams, where a "team" consists of any group larger than one. Science contrasts with the arts and humanities, where there has been little or no increase in collaborations (Jones, Wuchty, & Uzzi, 2008; Wuchty, Jones, & Uzzi, 2007). The growth from 1955 to 2000 in the extent to which teams dominate published papers has occurred in all broadly conceived science fields—natural sciences, engineering, and social sciences. In contrast, in the arts and humanities most papers (90%) are single-authored. Teams in medicine, biology, physics, chemistry, and materials science all averaged more than three persons.

Work produced by teams is also cited more often than single-authored papers, even after controlling for self-citations and excluding editorials and letters to the editor (Wuchty et al., 2007). Thus, teams produce more and more of the published work in science, and their work is cited more often than single-authored work. (That does not mean that the work is better, only that it is more influential.)

Along with an increase in team size there has been an increase in cross-institution collaborations in the natural and social sciences (but not in the arts and humanities; Jones et al., 2008). An analysis of who collaborates with whom across institutions shows the equivalent of assortative matching: when schools are placed into tiers based on how often their publications are cited,[1] one sees that individuals in the top tier tend to collaborate with each other more often than one would expect if individuals were randomly matched across institutions.[2] The same is true for individuals in the bottom tier of schools. That is probably due to three factors. One is the composition of professional networks and homophily—people tend to know people like themselves. Another factor may be a reluctance on the part of individuals at higher ranked institutions to collaborate with individuals at lower ranked institutions, and perhaps a reluctance (motivated differently) for those at lower ranked institutions to approach those in the top tier. The third factor is that top-tier schools have resources at their disposal that lower tier schools lack.

Most cross-institution collaborations in the natural sciences involve the 5% of schools that are in the top tier of citation rates. That 5% accounts for 59% of cross-institution collaborations. The schools in the top tier collaborate at similar rates with other schools in the top three tiers but collaborate less with schools in the bottom tier. The bottom tier, which consists of 80% of institutions, accounts for only 30% of cross-institution collaborations (Jones et al., 2008).

When individuals in the top 5% collaborate with others in the top 5% of schools, they benefit; the publications resulting from those collaborations are cited even more than publications resulting from within-institution collaborations at those schools. In contrast, when the 80% of schools in the bottom tier collaborate with other schools in the bottom tier, they reap no advantage from cross-institution collaboration. The bottom 80% only reaps a benefit (as measured by citations) when they collaborate with higher tier schools. The fact that top-tier schools have resources ranging from support

for graduate students to well-maintained physical plants to highly experienced staff may be a large part of the reason that the bottom 80% only benefits when it collaborates with higher tier schools.

Thus, diversity in the prestige of institution plays a role in collaborations. Individuals at very high-prestige institutions preferentially collaborate with researchers in the first and second tier (defined by number of citations), even though 80% of schools are in the bottom tier. Since women and people of color are overrepresented at low-prestige institutions, demographic diversity is less likely among top-tier collaborations. That hardens the isolation of women and people of color.

This is an example where the benefits of diversity that would arise from cross-institution collaboration across prestige boundaries appear to be undercut by the lower resources of lower prestige institutions.

When and Why Diverse Groups Fail

When diverse teams work well, they tend to outperform homogeneous groups and produce innovative solutions. But some diverse teams implode. What determines whether a team will work well or badly?

Three bodies of research are particularly relevant. One set of studies examines "identity congruence" theory (e.g., Swann, Johnson, & Bosson, 2009), another examines "psychological safety" and opportunities for learning (e.g., Edmondson, 1999), and a third examines effects of diversity on "nondiverse" group members (e.g., Phillips, Northcraft, & Neale, 2006). (See also van Knippenberg & Schippers, 2007; articles in Brief, 2008; see Galinsky, Todd, Homan, Phillips, Apfelbaum, Sasaki, et al., 2015, for a succinct overview, including policy suggestions.)

"Identity congruence" theory suggests what can go wrong in groups (Polzer, Milton, & Swann, 2002; Swann, Polzer, Seyle, & Ko, 2004). In any group, each member has an idea of what he or she can contribute, of what his or her strengths are; members want other group members to verify those strengths. And in any group, each member has an idea of what the other members can contribute, of what their strengths are. When those ideas are in alignment, the group flourishes. If, in short, you and I agree about what strengths we each bring to the group, if our identities converge, the group will prosper. When the ideas are not in alignment (if what I think I can contribute differs from what you think I can contribute), the group does

badly. Group members may not volunteer solutions to problems if they believe that the group will not value their contributions. Equally, some group members may simply be skeptical about the value of particular other group members.

One study that demonstrates the importance of identity (also sometimes called interpersonal) congruence tested 83 groups of MBA students who performed semester-long group projects (Polzer et al., 2002). The students were placed into groups that varied in how diverse they were. In groups where members' views of others coincided with those others' views of themselves, the products received higher grades than those that were not congruent. Further, those groups worked better together. Finally, group members' views of each other after ten minutes of interaction predicted the outcome well.

The implication from this study and others in this vein is that having one's identity verified and confirmed by other group members leads to superior performance and intact groups. Identity confirmation creates a sense of belonging. Leaders can potentially make use of such information by interviewing group members ahead of time to determine what they think they have to offer the group and explicitly conveying that information when introducing group members to each other. The role of leaders in assembling teams, and the role of team members, is thus clear: work to ensure that group members recognize each other's strengths and potential contributions. That will make it more likely that those strengths come to the fore and that potential contributions become actual contributions.

The work on identity congruence is related to work on "psychological safety." In a field study of 51 work teams in a manufacturing company, investigators found that teams where members thought they were respected and liked and could express their views freely—teams with high "psychological safety"—performed better than teams where that was not the case. Such teams could also learn from their mistakes better than other teams. High psychological safety led to better learning, which in turn led to better performance (Edmondson, 1999; Edmondson & Lei, 2014; Nembhard & Edmondson, 2011). Again, the notion of belonging comes in: in teams with high psychological safety, members feel that they belong, and belongingness creates flexibility. Further, psychological safety seems to be even more important for the performance of racial and ethnic minorities than of Whites (Singh, Winkel, & Selvarajan, 2013).

This research is particularly helpful for two reasons. The first is that it deals with work teams where the team members are known to each other. In much of the laboratory research that we discuss, the team members are meeting each other for the first time when the experiment begins, and their expected duration of interaction is at most a semester or a year and is generally considerably shorter. The research just described shows that even in groups where the members are known to each other, psychological safety improves group performance. The second reason the research is helpful is that the results hold independent of diversity. *All* groups, not just diverse groups, work better under conditions of psychological safety. Related work shows the relevance of psychological safety for racially diverse groups (Ely, Padavic, & Thomas, 2012; Ely & Thomas, 2001). Team leaders can thus see that helping teams, especially diverse teams, to collaborate well requires a respectful atmosphere that is tolerant of error.

One department's experience in creating a respectful atmosphere, an atmosphere that would increase psychological safety and facilitate more creative discussion, resulted in a list of guidelines for respectful philosophical discussion at colloquia (http://as.nyu.edu/philosophy/climate/initiatives /nyu-guidelines-for-respectful-philosophical-discussion.html). Examples include the following: "Don't be incredulous, roll your eyes, make faces, laugh at a participant, or start side conversations" (which we particularly like); "Objections are fine, but it's also always OK to build on a speaker's project. Even objections can often be cast in a constructive way, and even destructive objections can often be usefully accompanied by a positive insight suggested by the objection"; "Chairs should attempt to balance discussion between participants, prioritizing people who haven't spoken before, and keeping in mind the likelihood of various biases (e.g., implicit gender biases) when calling on questioners and applying these guidelines."

The third stream of studies (e.g., Phillips & Loyd, 2006; Phillips et al., 2006; Phillips, Rothbard, & Dumas, 2009) investigates group members' expectations about the conditions under which new ideas will surface. Group members *expect* people who are demographically different from them to have different perspectives. Although one might think that such expectations would lead group members to dismiss the opinions of those who are demographically different, the data suggest that they are instead more open to hearing a range of ideas when they are faced with people who occupy a range of demographic niches. A dissenting view expressed by

African American participants led White college students to engage in more complex thinking than when that same view was expressed by White participants (Antonio, Chang, Hakuta, Kenny, Levin, & Milem, 2004). One possible reason for the effect is that Whites, for example, know that African Americans have had different experiences and thus have a different basis for their contributions. But whether the data from these experiments can be generalized widely is unknown.

Some data suggest that women particularly contribute to helping a group work well, as we will describe. In one experiment, researchers recruited 40 teams of three people each from the general public via advertisements (Woolley et al., 2010). Before each group began the suite of tasks that the researchers provided, they took a ten-minute test of general intelligence. The team then completed four different tasks over five hours. The tasks recruited a wide range of different abilities, such as brainstorming together, performing a reasoning task together, coordinating a shopping trip to make it as efficient as possible within a set of constraints, and coordinating a typing task. All groups also played a game of checkers together against a computer as a criterion task. How well the group did on one task was correlated with how they performed on the other tasks, despite the diversity of the tasks. A combined value representing that overall performance—c—correlated well with the group's performance on the criterion task. Similar results occurred in a follow-up experiment that had a wider range of tasks and a more complex criterion task. The follow-up included 152 groups of different sizes ranging from two to five.

In both experiments, c was a much better predictor of the criterion task than was the group's average intelligence as measured by an intelligence test, or the score of the person in the group with the highest intelligence score, suggesting that groups are greater than the sum of their parts (Woolley et al., 2010). Both the average group intelligence score and the maximum group intelligence score were correlated with c, but three other factors were much more strongly correlated. One was how socially sensitive group members were, as measured by an independent test. Another was the extent to which group members shared equally in the discussion—the more even the speaking turns, the better the results. The third was the percentage of women in the groups—the more women, the better the results. Since women had higher social sensitivity scores than men did, it is likely that social sensitivity was the critical factor.

To summarize, diverse teams can be very effective in producing innovative solutions, more innovative than the solutions produced by individuals or by homogeneous teams. Diversity can be achieved in a variety of ways, including demographic status, which can include factors like sex and ethnicity. (Although age and other forms of diversity have not been systematically manipulated as a variable, all forms of diversity could yield benefits.) But the success of diverse teams rests on a mutual appreciation of what each group member has to offer, an openness to others' views, and the creation of an atmosphere where people feel free to express their opinions, even if their opinions are incorrect. Women appear at present to have an advantage in facilitating group harmony, but the ability to foster equal discussion is presumably equally achievable (perhaps with effort) by all genders and ethnic groups.

Institutional leaders and agencies supporting all scholarship, including those supporting scientific advancement, need to be concerned about arbitrary restrictions on who pursues scholarship in order to maximize the likelihood of innovation. Moreover, individual researchers will benefit from looking at all the available talent and diversifying their groups.

In this chapter we have emphasized the importance of diversity and inclusion for innovation and for better theories. We have done so because we see development of innovative solutions to scholarly and public policy problems and deeper understanding of intellectual issues as the key research values that an institution has. Our emphasis on the pragmatic value of diversity should not, however, detract from an understanding that an ongoing active commitment to equal access to all of society's demographic subdivisions is the fair thing to do.[3] Academic institutions pride themselves on their equal access. But access is meaningless if everyone's presence is not valued and appreciated. We think institutions can do better at creating the conditions for true inclusion, and learning how to develop successful diversity is one avenue to equality and excellence.

Notes

1. The citations exclude publications resulting from cross-institution collaborations, in order to have "clean" groups for measuring citations.

2. Because the quartiles are determined by number of citations per school, there are unequal numbers of schools in the different quartiles (Jones et al., 2008). The top quartile consists of 5% of the schools examined.

3. By emphasizing that diversity is "good for the organization" over diversity is "fair," one broadens one's conception of diversity (Trawalter, Driskell, & Davidson, 2016). The result of including more groups, such as older people, in one's conception of diversity is that some groups, such as African Americans, become a lower priority.

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