

**“Get your swabs out of my face!”**

**Links between Institutional Context and Public Support for New Technologies**

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**ABSTRACT**

While not dispositive, public opinion may be especially influential for elected officials on issues about which they have no prior record, views, or expertise. Views on medical and forensic biobanks, therefore, may be important for policy development. Comparison of views between them enable a test of our theory that differing levels of institutionalization are crucial in shaping public responses to technology; the overall population and politically salient groups have much stronger reactions, both positive and negative, to technologies that are deeply embedded in institutional context than to those with few institutional roots. The evidence comes from a new national survey of about 4000 Americans, with parallel items on medical and forensic DNA databases and almost 4000 open-ended comments explaining respondents’ stances on biobanking.

Americans tend to endorse medical biobanks, about which they know nothing, but offer even greater support for forensic biobanks, which are institutionalized through laws, budgets, widespread use, and elite backing.. However, African Americans and extreme conservatives show less enthusiasm, especially for forensic biobanks, than do whites or those less conservative, respectively. This unusual, perhaps unique, agreement is also explained by institutional context.

As a father, I can't thank you enough [for working to convict sexual predators.] . . . We also want to provide some support for things like DNA testing at the state levels. . . getting the databases set up. . . [I]t's so important to every family across America and there are just too many horror stories that remind us that we're not doing enough. . . We insist on justice.

--President Barack Obama (Gerstein 2010)

Forensic DNA repositories are gathered by the state without consent and are maintained for the purpose of implicating people in crimes. They signal the potential use of genetic technologies to reinforce the racial order not only by incorporating a biological definition of race but also by imposing genetic regulation on the basis of race.

--(Roberts 2011): 264-265

As these comments make clear, the societal use of new technologies is political. Beyond consensus on that point, however, we lack an encompassing explanation for when, why, and how. There is plenty of variation to work with. Both Republicans and Democrats increased the budget for the United States' National Institutes of Health (NIH) in the early 2000s, and cancer research remains nonpartisan. Environmental protection was bipartisan in the 1970s, but later became entangled in ideological and partisan battles. Evolutionary theory is embraced by the American left and rejected by the American right; the use of nuclear power for energy production is embraced by the right and rejected by the left. Left-wing and right-wing opponents of large government and large corporations unite in suspicion of childhood vaccinations. Many Europeans, but few Americans, are deeply exercised by the sale of genetically modified food; more Americans than Europeans mobilize around the issue of prenatal genetic testing.

These variations implicate partisanship and ideology; they show change over time, unusual coalitions, dissimilarities across national boundaries, and differences linked to the innovation itself. Here we focus on one explanation for that array: *institutionalization* as a key explanation for differing public responses to societal uses of new technologies. By comparing

scientific innovations that resemble one another substantively but differ in their institutional context in American society, we can explain differences in overall levels of support and differences across ideological or racial groups. We argue, in short, that institutional context is a key mechanism linking scientific innovation to public support.

Our case is genomic science--in particular, Americans' views of medical and forensic biobanks. The case is important for several reasons. Most generally, although public opinion is not dispositive in shaping policy choices about the use of genomics (or anything else), neither is it immaterial. Constituents' views may especially matter to elected officials for issues, such as biobanking, about which they have no prior record, views, commitments, or expertise; absent a dense policy context on a given issue, politicians may follow their voters' lead.

In addition, societal use of genomic science is a huge and expanding enterprise. The 2013 economic impact of genomics was estimated to be at least a trillion dollars in the United States alone (Battelle Institute 2013). In each year from 2000 to 2013 (the most recent year for which data are available), roughly 15 percent of annual U. S. patent applications and up to 18 percent of annual U.S. business expenditures on research and development were in the biotechnology sector (OECD.Stat). And both the science and its uses are very young.

Finally, biobanks are powerful inventions. *Time* magazine identified medical biobanks in 2009 as one of the "10 ideas changing the world right now;" they " 'will transform the way we see disease developing' " (Park 2009). A " 'landmark case' " using familial matching from a forensic biobank " 'will change the way policing is done in the United States,' " according to Los Angeles' police chief (Sher and Karlinsky 2010)].

Using biobanks as our case, we argue that the extent and nature of a new technology's embeddedness in society is an important factor in shaping and nurturing public endorsement.

Emerging technologies that receive support through funding, laws, and a culture of acceptance will enjoy more public approbation than those that do not, regardless of the technology's intrinsic value and even in the face of a high base level of societal "technology optimism." This argument extends beyond the standard literature on policy feedback loops in two ways. First, complex and mysterious scientific innovations whose workings are understood by very few and which offer both great risks and great benefits may be especially difficult for politicians to monitor. Thus opinion arguably plays a uniquely important role in their public trajectory.

Second, particular politically salient groups – in the case of biobanks, racial or ethnic minorities or strong ideologues—may respond differently than others do to institutionalized innovations. Blacks and extreme conservatives resemble one another in their views of biobanks more than either group resembles other races or people with other ideologies, respectively. This pattern, perhaps unique in the broad arena of public policies, can be explained only by the theory of institutionalization. Thus the embeddedness of a new technology may explain both broad public support and particularized opposition.

We begin by comparing medical and forensic biobanks, focusing especially on their levels of institutionalization. We then offer hypotheses about variation in overall public support and within two important political groups—variation, we argue, that results from different levels of institutionalization. Next, we use data from a new survey to analyze the hypotheses through both close- and open-ended survey responses. We conclude by discussing the politics surrounding societal uses of scientific innovations.

### **Medical and Forensic Biobanks**

Genomic biobanks emerged in the early 2000s as large organized collections of anonymized DNA samples that can be used for research or other public purposes. Medical and forensic

biobanks have similarities crucial for our analytic purposes. Both are developed and deployed to promote consensual societal goals—arriving at correct decisions in the criminal justice system, or diagnosing and treating genetic diseases. They also share risks, including potential violations of individual privacy; imposition on the donor or lack of meaningful informed consent; human error in cataloguing and using the data; racial, ethnic, class, and gendered over- and under-inclusion; and administrative failures of coordination, transparency, and management.

Medical and legal biobanks were, nonetheless, in different stages of development when we conducted a survey in 2011, a fact that permits us to study how and why their institutional context helps to shape public views of new technologies.

*Medical or Scientific Biobanks:* Medical DNA databases are mostly privately developed and held, idiosyncratically linked to one another, and publicly invisible. As of 2010, no state required or sponsored their development. The federal government has played almost no role in their creation or maintenance except through NIH grants or internal projects. Instead, hospitals, universities or research institutes, advocacy organizations, and pharmaceutical companies have developed biobanks for their own purposes; the chief collective characteristic of the 636 American medical biobanks as of 2012 was their “immense diversity” in content, purpose, organizational context, funding, management, and policies [(Henderson et al. 2013); (Stranger et al. 2008) offers the same characterization].

Medical biobanks lack public visibility as well as institutional coherence. A LexisNexis search of United States’ print media from June 1992 through June 2011<sup>1</sup> for “(DNA w/5 database) AND medicine AND NOT CODIS AND NOT crime” yielded 114 articles.

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<sup>1</sup> That is, from the earliest media discussions of medical DNA databases through the time of our survey. The search was of BODY or HEADLINE, in English, of newspapers, blogs, and magazines or journals in the United States. We excluded specialized professional or trade journals. The search was conducted on January 26, 2016.

Substituting “biobanks” for “(DNA w/5 database)” added 43 more, for an average of nine articles per year across all American newspapers. This number is not firm: there were many more articles in the 2000s than in the 1990s, and different search terms could change these results a little. But the crucial point *is* firm: Americans have had almost no opportunity to learn about medical biobanks from the print news media.

Nor have public officials filled the information vacuum. We found no comment from a political actor regarding medical biobanks in the mainstream media until President Obama’s call for precision medicine in 2015. They have been publicly visible only in court cases in Minnesota and Texas in 2010. In each case, plaintiffs successfully sued to have several million newborn bloodspots destroyed, on the grounds that the state had not obtained appropriate parental consent for their use in medical and scientific research (Carnahan 2011). So far as we can tell, these cases were almost never mentioned in media beyond the individual states.

*Forensic Biobanks:* Although they resemble medical DNA databases in being organized repositories of anonymized human genomic information intended to promote important societal goals, forensic biobanks operate in a dramatically different institutional context.

Forensic DNA databases were well established and widespread by the time of our survey in 2011. A 1994 federal law authorized a national DNA index, and specified its categories of data and government agencies’ access requirements. As of 2011, 47 states collected mandatory DNA samples from all convicted felons (the other three collected samples only from convicted sex offenders; they have now expanded their purview). Fifteen states retrieved DNA from certain misdemeanants, 21 from some arrestees, and a few from probationers or parolees, juveniles, and/or undocumented immigrants and others subject to deportation (all of these targets for collection have now been adopted by most states). Congress, states, and local governments

all had laws and regulations for collection, storage, and links to the FBI's national database, which contained over 10 million offender profiles (now over 12 million). All three levels of government funded labs and testing.<sup>2</sup> The infrastructure for using forensic biobanks for exoneration was less well established in 2011, but most states were developing laws and regulations for post-conviction DNA testing and for state compensation for exonerated ex-felons (Innocence Project n.d. ).

As both a cause and consequence of these differences from medical DNA databases, the media portray forensic databases much more than medical ones. Following the same procedure as with medical biobanks, a LexisNexis search from June 1989 through June 2011<sup>3</sup> for “(DNA w/5 database) AND crime AND NOT CODIS AND NOT medicine” in American print news media, and a parallel search for “CODIS,” yielded 2505 items.<sup>4</sup> Different search terms would change these results somewhat, but would have little impact on the overall result of roughly thirteen times as many print media articles on forensic as on medical biobanks.

Television has contributed enormously to popularizing forensic biobanks and making clear their impact on criminal justice. The crime drama television series *CSI: Las Vegas* started in 2000 and spun off parallel series as well as copycat shows, books, and video games. It was the most watched show in the world for five years; its 2009 international audience was estimated

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<sup>2</sup> There were “more than 500” federal, state, and local crime labs in 2013, as well as private labs used by law enforcement agencies (Chavli et al. 2013). Figures vary depending on just what funds are included, but journalists report \$1.2 billion allocated by Congress between 2005 and 2015 “toward addressing the nation’s DNA testing needs” (Reilly 2015)-- and that figure does not include expenditures by other levels of government.

<sup>3</sup> That is, from the phrase’s first occurrence in U.S. news media through the date of our survey. See note 1 for details of the search.

<sup>4</sup> Substituting “biobank” for “(DNA w/5 database)” added two items to crime-related reporting.

at 74 million. Claims of the “CSI effect”-- that watching crime shows makes jurors insist on forensic evidence in order to convict defendants-- receive no consistent empirical support. But the show’s perennial popularity does support the weaker expectation that Americans are familiar with forensic DNA databases, in contrast to medical or scientific DNA databases.

Forensic biobanks have also made dramatic public appeals to a different constituency than law-and-order proponents. The Innocence Project seeks to “exonerate the wrongfully convicted through DNA testing” and “reform the criminal justice system to prevent future injustice” (<http://www.innocenceproject.org/>). It too has been institutionalized, through chapters or affiliates in law schools throughout the United States; the Innocence Network links 60 organizations in a dozen countries. As of this writing, about 330 people convicted of felonies, mostly poor men of color, have been exonerated, often after years or decades of imprisonment. A Lexis-Nexis search for “Innocence Project,” using the same years and sources as for forensic and medical databases, yielded 995 items. That generates an average of 59 mentions per year from its first appearance, but the average is misleading; from three in 1994, the number of articles increased to 100 in the first half of 2011.

Perhaps most important for institutionalization’s link to public opinion, leaders of both major political parties promoted forensic biobanks during the 2000s while none spoke against them. President Obama’s statement that “we insist on justice” was echoed by Attorney General Eric Holder, liberal governors of New York and Maryland, Republican and Democratic members of Congress, and a stream of governors, police officials, and legislators. Attorney General Holder spoke for all in asserting that “the regular collection of DNA samples from federal arrestees and defendants must be a priority” (Markon 2010).

## **Hypotheses**

*Overall population:* Scholars have long argued that a policy with media visibility, consensual endorsement from public officials, and a solid organizational structure will evoke public support (Zaller 1992). A newly established policy may also create a constituency with the moral commitment, economic stakes, and political zeal to maintain or expand it [(Campbell 2003); (Be'land 2010); (Gusmano et al. 2002)]. More mundanely but of equal importance, William James' insight that "habit is thus the enormous flywheel of society" provides grounds for expecting public support for a well-established policy; more precisely, "satisfactory experiences enhance the tendency to repeat the same course of action because the instrumental action becomes more strongly associated with the goal one initially wished to attain" (Aarts et al. 1998): 1358). In short, we have political, policy-based, and psychological reasons to expect institutionalization to be associated with public approval.

However, that cluster of arguments has an analytic weakness: we know of no research comparing societal responses to new technologies that resemble one another in key substantive characteristics but differ in their institutional context of legislation, funding, visibility, concerted use, and public officials' support. That is, we have reason to expect institutionalization to be a central mechanism for explaining public support for societal use of a scientific innovation, but no direct evidence on the point. But if similar innovations (medical and forensic biobanks) emerge to address similarly urgent public problems (curing disease and solving crimes),<sup>5</sup> but one is more deeply institutionalized *and* receives stronger public support, we can claim that institutional context helps to shape views on using a scientific innovation. That will be valuable information

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<sup>5</sup> The General Social Survey (GSS) asked about support for spending on "improving and protecting the nation's health" and "halting the rising crime rate" [sic] twenty-nine times from 1973 through 2014. On average, 66 percent of respondents endorsed greater spending on health care and 67 percent on crime control.

for political scientists, policy-makers, advocates, and scientists alike.

Understanding the links between institutional context and public opinion is crucial because of path dependence: once institutions are established they are hard to dislodge, especially if they create self-propagating feedback loops [(Pierson 2004); (Mahoney 2000); (Levi 1997)]. Thus early institutionalization could explain long-term divergence over time in public approbation and further embeddedness of otherwise similar new technologies.

To test the proposition that institutional context is associated with popular support for societal use of new technologies, we hypothesize:

*H1: Despite their similarities in design, content, underlying science, and purpose, forensic biobanks receive greater support from Americans than do medical biobanks.*

*Politically Salient Groups:* If groups with distinct views about the institutionalization of a new technology respond to it distinctively, that pattern of responses provides further support for the claim that institutional context is associated with stronger public approval. We explore this possibility for two sets of politically relevant groups --Americans with different political ideologies, and those of different races or ethnicities.

There are two opposing grounds for expecting different levels of support for biobanking from liberals and conservatives. On the one hand, liberals have long been associated with support for science, policy innovation, and governmental activism; conversely, scholars argue that conservatives are frequently suspicious of innovation, hostile to activist governments and their new programs, and relatively disinclined to use science as a basis for decision making [(Hirschman 1991); (Gauchat 2011; 2012); (Mooney 2005)]. Strong conservatives in particular may find expensive, far-reaching, deeply personal forensic biobanks, along with the whole massive criminal justice system, to be a prime case of governmental overreach, threat, or

incompetence or fecklessness (Keller 2015); (Teles and Dagan 2016). Thus we hypothesize:

*H2a: liberals support forensic biobanks more than conservatives do.*

An alternative logic, however, suggests the opposite of H2a. Perhaps conservatives' commitment to a strong criminal justice system outweighs their suspicion of policy initiatives in this arena. After all, partisans tend to endorse policies closely associated with (or "owned by") their own party; for Republicans, one such issue is crime control [(Petrocik 1996); (Be'linger and Meguid 2008)].<sup>6</sup> In addition, conservatives usually back law and order policies more than liberals do. Two examples: despite strong distaste for increased federal spending, a disproportionately high share of "extremely conservative" respondents in the 2012 American National Election Study [ANES] endorsed more public expenditures on "dealing with crime," and conservatives are more supportive of sending troops to the Mexican border to combat "crime and violence caused by drug traffickers" (CNN/Opinion Research Corporation, April 3-5, 2009). More conservatives than liberals support "guaranteeing law and order" instead of "guaranteeing individual freedom" when asked to choose between the two values (*Washington Post/Kaiser/Harvard University Politics and Policy Survey*, Aug. 2- Sept. 1, 2002; *ibid.* Aug. 10-27, 1998). Thus we hypothesize, as an alternative to H2a:

*H2b: conservatives support forensic biobanks more than liberals do.*

Since medical biobanks are not embedded in government structures or policies, public attitudes toward them do not involve ideological responses to governmentality. They may, however, evoke a different set of responses to institutionalization through concern about privacy,

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<sup>6</sup> Republicans and conservatives are not always the same people; the correlation between the two self-descriptions in our survey is 0.48, mainly because a number of self-identified ideological "moderates" also identify as Republican. However, we found no scholarship on issue ownership by ideology, so we rely on evidence about partisan issue ownership.

confidentiality, or consent. The fourth epigraph gives a flavor of this dimension, as do the lawsuits to destroy newborn blood spots (Goldenberg A. J. 2009); (*Beleno et al. v. Texas Department of State Health Services* 2009); (*Bearder v. Minnesota* 2011).

Conservatives generally express more concern about privacy than do liberals (CNN/Opinion Research Corporation Poll, March 19-21, 2010; Gallup/*USA Today* Poll, Oct. 12-13, 2011; United Technologies/*National Journal* Congressional Connection Poll, July 5-8, 2012; Gallup Poll, June 10-11, 2013; Oct 3-16, 2013), and they usually worry more about privacy violations through genetics research (NBC News/*Wall Street Journal* Poll, June 14-18, 2000). Furthermore, the evidence cited above about liberals' general support for science and innovation should apply in the medical as well as the judicial arena.

Thus we hypothesize:

*H2c: liberals support medical biobanks more than conservatives do.*

Racial and ethnic groups provide our other test case for analyzing whether institutional context is associated with differences in views across groups. We distinguish among self-defined non-Hispanic blacks, non-Hispanic whites, non-Hispanic Asians, and Hispanics, who may be of any race; for theoretical reasons we focus especially on whites and blacks.

What is understood as “science” in a given historical period can become a tool of racial oppression: nineteenth-century racial science and twentieth-century eugenics are central, but not the only, instances. We might therefore expect African Americans to be more cautious than whites about institutionalization of scientific innovations. Some evidence supports that expectation; 28 percent of blacks compared with 38 percent of whites agreed in the 2012 ANES that the government should use scientific methods to solve important problems. In 2009, although a large majority overall concurred, an even higher proportion of whites than blacks

agreed that “science has had a mostly positive effect on our society” (Pew Research Center/ American Association for the Advancement of Science, Science Survey, April 28-May 12, 2009).

Many black Americans may in particular see strong reasons to mistrust the institution of medicine. Three in five have heard of the Tuskegee syphilis experiment and almost three quarters of those correctly identify its basic contours (Kaiser Family Foundation 1999): 24). Across 28 iterations of the GSS from 1973 through 2014, a somewhat smaller share of black than white respondents expressed great confidence in “the people running. . . medicine.” In 1999, only 15 percent of African Americans agreed that racism is not a problem in the health care arena; blacks perceived racial disparities in obtaining routine medical care or health insurance, receiving high quality treatment for heart disease or HIV/AIDS, even finding a doctor nearby (Kaiser Family Foundation 1999). A best-selling book on the unconsented use of Henrietta Lacks’ DNA for medical research provides a recent and vivid reinforcement for blacks’ mistrust of medical researchers (Skloot 2010).

Black Americans are even more wary of or hostile to the criminal justice system. The United States’ history of racial oppression under the guise of law and order is broad and deep; Mississippi’s Parchman farm, vagrancy laws, and the criminalization of black poverty (Muhammad 2011) are prominent examples. Policies of “stop and frisk” and zero tolerance for small infractions, as well as police departments’ reputations for excessive force and racial profiling, reinforce blacks’ mistrust. “Three strikes” laws, incarceration for drug offenses, and the racial disparity in death sentences spread mistrust from the police to the courts, so that the entire institution of criminal justice can seem illegitimate.

And it does. Despite their desire for effective policing and criminal justice, blacks

express much less confidence in the actual institutions and their participants than do whites, and are much more likely to perceive widespread discrimination [(GSS; (Newport 2014), (Jones 2015)). To cite only one example, fewer than a tenth of blacks agreed in 2015 that “the country’s criminal justice system treats whites and blacks equally” (CNN/Kaiser Family Foundation 2015): 22). Therefore we hypothesize:

*H3a: Blacks are less likely to support both medical and forensic biobanks than are whites.*

*H3b: The difference between the races in support for biobanking will be greater in the forensic than the medical arena.*

## **The Evidence**

“Genomics: Knowledge, Attitudes, and Politics [GKAP]” is an online 20-minute survey conducted in May 2011 by Knowledge Networks Inc. (now part of GfK), of 4,291 randomly selected U.S. adults. The survey was stratified by racial or ethnic group, which respondents had identified when they joined the Knowledge Networks panel. GKAP included 1,143 non-Hispanic whites, 1,031 non-Hispanic African Americans, 337 non-Hispanic Asians, 1,096 Hispanics of any race (roughly half of whom took the survey in Spanish), and small numbers of other groups.

GKAP included 111 close-ended questions, of which we focus on ten. In addition, two open-ended items asked respondents to explain why they had (in the prior question) expressed willingness or unwillingness to contribute to a medical or forensic biobank. We received over 3,400 responses to each open-ended item, which we analyzed in order to explore respondents’ own explanations for their views of biobanks.

For the close-ended items, GKAP results are weighted to present nationally

representative results for the full sample and the analysis of ideology. We weighted each racial or ethnic group separately for analyses that focus on race or ethnicity, so that responses are representative of that group.

### **Descriptive Results**

*Awareness:* The simple fact of awareness supports our basic claim that the two types of biobanks are differentially institutionalized in ways that are associated with public opinion. Medical biobanks are invisible: fewer than 1 percent of GKAP respondents have heard or read “a lot” about them; fewer than 10 percent knew “some;” seven in ten admitted to knowing “nothing.”<sup>7</sup> In contrast, forensic biobanks are familiar: 20 percent claimed to have heard or read “a lot” about them; another 35 percent had heard or read “some;” only one fifth knew “nothing.” Some respondents explained their reluctance to participate in a biobank through their lack of information (all spelling and grammar are reported verbatim) :

- I am not sure about biobanks. never heard of it until this survey. [#2191, medical]
- not enough to know about it. Would need to do more research [#709, medical]
- Don’t know enough to say [#3559, legal]

*Overall Support for Institutionalized Innovations:* Even in the context of complete ignorance about the innovation, Americans are, at base, technology and science optimists [(Hjorleifsson et al. 2008); (Hazlett et al. 2011)]. Majorities, sometimes very large, agree that “government investments in engineering and technology usually pay off in the long run” (Pew Research

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<sup>7</sup> GKAP introduced the questions on medical biobanks as follows: “Organizations across the United States and around the world are working together to enable scientists from different laboratories to study thousands of DNA samples collected from patients or the general public. These collections of DNA samples are sometimes called biobanks.” It introduced forensic biobanks as follows: “The federal government and almost all states require collection of a DNA sample from all people convicted of a serious crime. The samples are stored and may be used in future cases to try to determine a person’s guilt or innocence of a particular crime.”

Center 2014), that scientists, doctors, or engineers contribute “a lot” to society’s well-being (Pew Research Center 2009), that technological or scientific innovations make life easier and people more efficient, or bring people closer to friends and family (Pew Research Center 2010), open opportunities for the next generation (GSS 2006, 2008, 2010, 2012), or improve Americans’ standard of living (Research!America/ ScienceDebate2008.com Presidential Debate on Science Survey, May, 2008).

Thus even an invisible and unknown new technology, functioning here essentially as a scientific Rorschach test, generates support. Five times as many GKAP respondents judge that medical biobanks to be “likely to do more good than harm to society;” substantial majorities support public research funding for scientific DNA databases or express willingness to contribute a DNA sample for research purposes. Explanations for that willingness were often based on approval of the institutions of medicine or science:

- It seems not to be risky in terms of personal privacy and would further the advancement of medical research and treatment of disease [medical, #143]
- I've already done this. It's for the betterment of the scientific community that we learn as much as we can about what makes us tick. [medical, #3008]
- I believe in advancing scientific knowledge and helping people who want to do research -- even if it will never help me personally [medical, #2311]

But even this majority endorsement is weaker than Americans’ support for forensic biobanks—thus confirming H1, which predicts that public support for the institutionalized innovation of forensic biobanks is greater than support for the noninstitutionalized innovation of medical biobanks. Fifty-eight percent of GKAP respondents judged forensic biobanks to do “more good than harm to society,” while only 7 percent argued the reverse; the corresponding

figures for medical biobanks were 45 and 9 percent. That is a statistically significant difference with a paired t-test ( $t = -17.828$ ,  $df = 4127$ ,  $p\text{-value} < 2.2e-16$ ).<sup>8</sup> Eighty-six percent endorse increased government funding for forensic biobanks, compared with 60 percent for medical biobanks; that too is a statistically significant difference with a paired t-test ( $t = -110.19$ ,  $df = 4146$ ,  $p\text{-value} < 2.2e-16$ ).<sup>9</sup> Respondents' explanations of why they would contribute DNA to a forensic biobank again suggest the importance of institutional trust:

- I believe DNA is a great resource for the criminal justice system with a high probability of determining guilt or innocence. If my DNA would directly affect a case, I would be willing to contribute [legal, #3103]
- help clear innocent people from being wrongly convicted . [legal, #2740]
- I have nothing to hide: I personally think that everyone's DNA and fingerprints should be taken at birth for the database. This would accelerate the justice process if the suspect could be identified. [legal, #4611]

*Group-based Support for Institutionalized Innovations:* Most politically salient groups resemble Americans as a whole in their levels of support; the exceptions reveal a different way in which institutional context helps to shape and explain opinion.

TABLE 1 here

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<sup>8</sup> These results for forensic biobanks accord with previous survey results. Others have found that between three fifths and 95 percent of Americans endorse some version of governmental DNA databanks to determine guilt or innocence (*Time/CNN/Yankelovich Partners Poll*, Dec. 17-18, 1998; Democratic Leadership Council, June 10 - June 13, 2000; John W Pope Civitas Institute North Carolina, March 8, 2010). More generally, see (Singer et al. 2005) and its predecessor articles.

<sup>9</sup> GKAP respondents are, however, about equally willing to contribute their own DNA sample to the two types of biobanks, with about three fifths concurrence in both cases. A paired t-test shows no statistically significant difference between the proportions willing to contribute to medical and forensic biobanks ( $t = 0.96936$ ,  $df = 4290$ ,  $p\text{-value} = 0.3324$ ).

Results in table 1 show that larger proportions in all groups see benefits of the institutionally-embedded forensic biobanks than of noninstitutionalized medical biobanks (compare columns 1 and 4). Similarly, larger majorities in each group endorse government funding for forensic than for medical biobanking (columns 3 and 6). Both of these results show that H1 holds at the level of specific groups, not only in the overall population.<sup>10</sup>

Table 1 also provides descriptive evidence for exploring the second and third hypotheses. H2a predicts that liberals are more enthusiastic about forensic biobanks than conservatives are; H2b posits the opposite. The first of these opposing arguments wins the contest, because respondents identifying as conservative and (especially) “extremely conservative” see less good and more harm in biobanking than do other ideological groups, are least willing to contribute a DNA sample, and are least likely to endorse (especially to “strongly” endorse) government funding for the new technology. Consistent with that result, Table 1 shows support for H2c, which predicts that liberals will also endorse medical biobanks more than conservatives will.

Comparisons across racial and ethnic groups yield similar, though less dramatic, results. H3a, which predicts less enthusiasm about biobanking from blacks than from whites receives support; blacks see less good than whites do in both types of DNA databases and are less willing to contribute their own sample. (Curiously, however, they support government funding at the same rate.) Finally, H3b, which predicts a greater racial disparity in support for forensic than for medical biobanks, receives partial support, especially on the crucial question about societal risks of the new technology. Blacks are almost 20 percentage points less willing than whites to endorse forensic biobanks, a greater discrepancy than the black-white 8 percentage point difference in endorsement of medical biobanks. With a few exceptions, the evidence so far

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<sup>10</sup> Willingness to contribute a DNA sample does not, however, accord with H1, for reasons that we explore below.

confirms our theory of the importance of institutional context in explaining public views about new technologies. The more deeply embedded innovation almost always receives a warmer reception, from the population overall as well as within most politically salient groups. The theory of institutionalization also explains the two groups that do not fit that generalization. Blacks have good reason to be wary of medical research and of almost any innovation in the criminal justice arena, and the extremely conservative generally oppose any institution that seems to strengthen government or threaten privacy.

### **Statistical Results**

Logistic regression analyses enable more precise comparisons of groups' views about institutionalized and noninstitutionalized scientific innovations, again with a focus on the outcome variables of societal good or harm, willingness to contribute, and public funding. Results for hypotheses 2 and 3 are in tables 2, 3, and 4, each of which addresses one of the three outcome variables.

TABLES 2, 3, and 4 here

*Ideology:* Column 4 in each of tables 2, 3, and 4 provides the evidence to weigh H2a (liberals endorse forensic biobanks more than conservatives do) against its opposite in H2b. Intriguingly, both—apparently contradictory—hypotheses receive support; liberals both endorse *and* oppose forensic biobanks more than do conservatives. This apparent paradox is unraveled by considering the intensity of respondents' conservatism. Intensity of ideology provides the only means in this survey for expressing a difference in kind; that is, some who identify as “extremely conservative” appear to be libertarians. As table 2 shows, extreme conservatives are especially likely to see more harm than good in forensic biobanks (H2a; results are compared with the excluded group of self-identified moderates), despite the fact that those who identify as slightly

conservative or conservative are more likely than liberals to see more good than harm (H2b). Views on government funding (table 4) are similar though less stark; liberals and slight conservatives endorse funding, while conservatives and, especially, extreme conservatives are most likely to oppose it (H2a). Liberals and conservatives concur in willingness to contribute to forensic biobanks (table 3)-- but not extreme conservatives, who are most likely to be hostile (H2a). Adding controls for age, gender, education, race, and income *increases* differences between extreme conservatives and all others.

In accord with our theory, extreme conservatives frequently couched their opposition to forensic biobanks in terms of rejection of governmental institutions. Among codeable explanations for unwillingness to contribute a DNA sample to a legal biobank (roughly three tenths of the 3400 coded responses), between 40 and 52 percent of the other ideological groups wrote of mistrust; 58 percent of extreme conservatives did so. In their words:

- STOP GOVERMENT FROM USING PERSONAL INFORMATION FOR NO REASON --- WE ARE NOT CRIMINALS (legal, # 1434).
- WHY WOULD I GIVE A SAMPLE OF MY DNA TO THE POLICE/GOVT SO IF I COMMITED A CRIME LARGE OR SMALL. WHO IS TO SAY THAT THE POLICE WOULDN'T WANT A SAMPLE FROM A PERSON FOR A MOVING VIOLATION. THEN YOU ARE IN THE SYSTEM FOR HAVING A VIOLATION AGAINST YOU.MAKING ME FEEL LIKE THEIR COULD BE SOME DISHONEST HANDLING OF A PERSONAL ID SUCH AS DNA. [legal, #3398]
- I do not believe that Big Brother needs my DNA (legal, #3265)

For the extremely conservative, some of whom are libertarians, the dangers presented by strong governmental institutions, especially those that could threaten individual privacy,

outweigh support for policies promoting law and order. For other conservatives, concern about crime and social order generally trumps distaste for strong government institutions.

Hypothesis H2c (liberals support medical biobanks more than conservatives do) is more straightforward, and receives support. Column 1 in tables 2, 3, and 4 shows liberals' strong endorsement of the novel idea of medical biobanks, willingness to contribute a DNA sample to them, and support for public funding. The slightly conservative and conservatives have mixed views, and extreme conservatives are, again, hostile. Adding controls for age, gender, education, race, and income again *increases* the differences between extreme conservatives and others.

Conservatives' explained their unwillingness to contribute a DNA sample to a medical biobank more in terms of privacy concerns<sup>11</sup> than generalized mistrust of institutions, but the comments show close links between the two themes. They observed, for example:

- Because the government has no need of my DNA and needs to STOP trying to control everything! (medical, #2264)
- I would expect that the samples would eventually be used for some nefarious purpose. and do not support government funding or regulation of many so called "well intended" projects. (medical, #1912).
- An invasion of personal privacy (not that we Americans have any left as it is) [medical, #2506]

*Race*: Hypotheses 3a (blacks support biobanking less than whites do), and 3b (the racial difference is greater for forensic than for medical biobanks) both receive support, as shown in

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<sup>11</sup> Among codeable explanations for unwillingness to contribute to a medical biobank (roughly three-tenths of the 3570 coded responses), fewer than 30 percent of liberals and slight conservatives wrote of wanting to protect their privacy, compared with 33 percent of conservatives and 35 percent of extreme conservatives.

columns 2 and 5 of tables 2, 3, and 4. With regard to the former, African Americans are substantively and statistically less likely than whites to see more good than harm in medical biobanks and are less willing to contribute a DNA sample. Blacks' views on public funding for legal biobanks also support H3a but below a level of statistical significance; their views on funding medical biobanks contradict H3a. Adding controls for age, gender, education, ideology, and income eliminates the contradiction with H3a with regard to funding, but otherwise changes the results only slightly.

H3b also receives support. The disparity between blacks and whites in judgments of the societal benefits of biobanking is almost twice as large for legal as for medical biobanks, and the disparity in willingness to contribute a DNA sample is slightly larger for legal than for medical DNA databases. The pattern of support for public funding, however, does not accord with H3b. Adding controls for age, gender, education, ideology, and income eliminated the contradiction with H3b and retained the larger black-white disparity on societal benefits of legal as compared with medical biobanks.

African Americans sometimes sounded a lot like extreme conservatives. Among codeable open-ended responses, whites were more likely than blacks to invoke trust in the relevant institutions as an explanation of their willingness to contribute to either kind of biobank; conversely, blacks were more likely to invoke mistrust of institutions to explain unwillingness to contribute a DNA sample (whites were more likely to offer privacy-based explanations for unwillingness to contribute).<sup>12</sup> Thus blacks reported:

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<sup>12</sup> More precisely:

	<i>Medical biobanks</i>	<i>Forensic biobanks</i>
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- I don't trust the police, lawyers, prosecutors, or judges do [sic] do the right thing (check the innocence project websight-look at Dallas Texas those wrongly convicted-and the State of Illinois death row innocent people-to see what I mean). (legal, #79)
- Without proper regulation, my DNA could be planted at a crime scene whether or not I was there. (legal, #1150)
- there is no sure way to make sure that the swab is from you. the goverment has a lot of tricks up its sleeve now a days. you could be falsly accused by someone switching the dna to make you guilty of something you didn't do or be treated for some desease [medical, #1341]
- i don't need anyone experimenting on me [medical, # 1250]

### Conclusion

To summarize: Americans tend to be technology optimists, even about scientific innovations about which they know nothing. From that baseline, they are yet more enthusiastic about forensic biobanks, which are deeply institutionalized in American society and politics, than about medical biobanks, which are not. Black and extremely conservative Americans, however, show less support for biobanking than do whites, liberals, and mild conservatives, especially with regard to

	<i>Willing-trust institutions</i>	<i>Unwilling-mistrust institutions</i>	<i>Unwilling-privacy</i>	<i>Willing-trust institutions</i>	<i>Unwilling-mistrust institutions</i>	<i>Unwilling-privacy</i>
whites	12.9%*	25.3%	39.9%	37.1%	44.2%	20.7%
blacks	6.5	36.5	22.2	24	57.8	10.6

\*% in each cell is the share of interpretable responses among the Willing (or Unwilling) for that type of biobank. The denominator for each racial group and each condition (medical-willing; medical-unwilling etc.) differs, depending on how many in that group and condition provided an interpretable response. About 860 white and 650 black respondents provided interpretable responses to the open-ended GKAP queries.

forensic biobanks. Unlike in most policy arenas, levels of education, income, gender, and age are mostly unrelated to views of biobanking.

This pattern is highly unusual. We can think of no other policy arena in which blacks and libertarians agree with one another but not with other Americans. The theory of institutionalization makes sense of that “strange bedfellows” pairing, as well as the broader point about greater public enthusiasm for legal than for medical DNA databases. First, public visibility, embeddedness in the legal and legislative arenas, and elite endorsement explain Americans’ enthusiasm for DNA databases in the criminal justice arena; medical DNA databases lack those characteristics, and arguably as a consequence, receive less support. Second, the United States’ history of institutionalized racial mistreatment in the arenas of criminal justice, medicine and medical research, and the biological sciences helps to explain black Americans’ caution, while libertarians’ rejection of strong institutions in either public or private arenas, and concern for individual privacy, help to explain extreme conservatives’ hostility. Institutionalization, in short, can strengthen support *or* opposition to a scientific innovation, depending on the innovation’s content, context and history, and degree and type of legal standing, elite endorsement, public visibility, and embeddedness in other structures. In sum, the more novel the innovation, the more that institutions matter in shaping reactions to it, and the more that public opinion is likely to matter in shaping politicians’ treatment of the innovation.

Expanding from this case the logic of path dependence implies that, after an innovation is put to societal use, the extent and type of its institutionalization will shape public support and opposition for associated innovations down the road. This point is especially important for emerging technologies, about which most individuals are completely ignorant; institutionalization writes on a blank slate, and then these new bits of prose get assimilated into

longstanding fears and hopes. If the biological sciences are to the twenty-first century what the physical sciences were to the twentieth, as many experts predict, how the first of the new genomic technologies are being structured, framed, financed, and used may shape public responses to multi-trillion dollar enterprises over the next few decades.

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**Table 1: Support for Biobanks, by Group, GKAP 2011 (percent agreeing)**

	<i>Medical biobanks</i>			<i>Forensic biobanks</i>		
	<i>1) More good than harm to society/more harm than good</i>	<i>2)Contribute (willing + somewhat willing)</i>	<i>3) Government should fund (strongly + somewhat support)</i>	<i>4) More good than harm to society/more harm than good</i>	<i>5) Contribute (willing + somewhat willing)</i>	<i>6) Government should fund (strongly + somewhat support)</i>
<b>Ideology</b>						
Extremely liberal	49/ 7	68	72	59/5	53	91//56
Liberal	51/ 7	69	76	61/6	61	89//48
Slightly liberal	55/ 7	69	75	63/7	63	89//40
Moderate	44/ 8	64	60	57/6	59	87//41
Slightly conservative	52/10	64	61	64/7	61	90//46
Conservative	38/14	58	39	62/7	58	83//34
Extremely conservative	33/23	42	24	50/16	45	80//29
<b>Race or ethnicity</b>						
White	48/ 8	64	54	68/ 4	60	86
Black	40/ 8	56	57	49/ 8	52	83
Latino/a	48/13	68	70	56/12	65	85
Asian American	49/ 7	64	66	57/ 6	58	86
Multiracial	48/10	65	58	70/ 3	58	84
Native Hawaiian/ Pacific Islander	35/ 7	61	xx	53/ 6	53	xx

The missing response option in columns 1 and 4 is “equal amounts of harm and good to society.” For columns 2 and 5, the other response options were “somewhat unwilling” and “unwilling.” For columns 3 and 6, the other response options were “somewhat oppose” and “strongly oppose.” First seven rows are weighted so as to be nationally representative; last six rows are weighted separately by racial/ethnic group.

Subsample sizes: 1) NonHispanic White 1143; nonHispanic Black 1031; Hispanic (any race) 1096; nonHispanic Asian 337; multiracial 635; Native Hawaiian/Pacific Islander 49 ; 2)Extremely liberal: 142; liberal 682; slightly liberal 507; moderate 1422; slightly conservative 544; conservative 707;

extremely conservative 137

**Table 2: Logit regression: agreement that a medical or forensic biobank will result in "more good than harm," GKAP 2011.**

	<i>Medical biobanks</i>			<i>Forensic biobanks</i>		
	(1)	(2)	(3)	(4)	(5)	(6)
Extremely liberal	0.67*** (0.18)		0.63*** (0.19)	0.38** (0.19)		0.39** (0.20)
Liberal	0.37*** (0.10)		0.28*** (0.10)	0.23** (0.10)		0.22** (0.11)
Slightly liberal	0.65*** (0.11)		0.53*** (0.12)	0.25** (0.11)		0.17 (0.12)
Slightly conservative	0.67*** (0.10)		0.58*** (0.11)	0.71*** (0.11)		0.56*** (0.12)
Conservative	-0.08 (0.09)		-0.21** (0.10)	0.39*** (0.09)		0.15 (0.10)
Extremely conservative	-0.31* (0.17)		-0.37** (0.17)	-0.28* (0.16)		-0.55*** (0.17)
Black		-0.46*** (0.10)	-0.41*** (0.11)		-0.94*** (0.10)	-0.70*** (0.11)
Hispanic		-0.11 (0.09)	0.13 (0.11)		-0.62*** (0.09)	-0.28** (0.11)
Asian		0.06 (0.15)	-0.09 (0.16)		-0.46*** (0.15)	-0.41** (0.16)
Multiracial		-0.17 (0.30)	-0.09 (0.31)		-0.13 (0.31)	0.12 (0.32)
Native Hawaiian/Pacific Islander		-0.44 (0.65)	-0.21 (0.69)		-0.23 (0.64)	-0.51 (0.69)
SES controls included *	no	no	yes	no	no	yes
Constant	-0.35*** (0.06)	-0.09** (0.04)	-2.68*** (0.96)	0.28*** (0.06)	0.73*** (0.04)	-2.80*** (0.89)
N	4,054	4,174	4,054	4,053	4,171	4,053
Log Likelihood	-2,561.27	-2,668.07	-2,457.46	-2,485.31	-2,517.69	-2,335.40
AIC	5,136.54	5,348.13	5,004.91	4,984.61	5,047.38	4,760.80
p < .1; **p < .05; ***p < .01						

All observations weighted using nationally representative weights.

\*SES controls include years of education, gender, income, and age.

- Age is statistically significant but substantively trivial (medical: 0.01\*\*\*; SE 0.002. legal 0.02\*\*\*; SE 0.002)
- No gender effect
- Higher levels of education were associated with stronger support for both types of biobanks.
- No income effect for medical arena; in legal arena, higher incomes were associated with stronger support.

**Table 3: Logit regression results: willingness to contribute to medical or forensic biobank, GKAP 2011**

	<i>Medical biobanks</i>			<i>Forensic biobanks</i>		
	(1)	(2)	(3)	(4)	(5)	(6)
Extremely liberal	0.47** (0.20)		0.50** (0.20)	-0.29 (0.18)		-0.29 (0.19)
Liberal	0.39*** (0.11)		0.38*** (0.11)	-0.06 (0.10)		-0.09 (0.10)
Slightly liberal	0.49*** (0.12)		0.42*** (0.13)	0.16 (0.12)		0.08 (0.12)
Slightly conservative	0.09 (0.11)		0.06 (0.11)	0.06 (0.10)		0.07 (0.11)
Conservative	-0.31*** (0.09)		-0.40*** (0.09)	-0.13 (0.09)		-0.15 (0.09)
Extremely conservative	-1.06*** (0.16)		-1.17*** (0.17)	-0.65*** (0.16)		-0.68*** (0.16)
Black		-0.37*** (0.10)	-0.52*** (0.11)		-0.41*** (0.10)	-0.51*** (0.11)
Hispanic		0.22** (0.10)	0.24** (0.11)		0.28** (0.09)	0.18* (0.11)
Asian		0.14 (0.16)	-0.04 (0.17)		0.10 (0.15)	0.002 (0.16)
Multiracial		0.11 (0.31)	0.12 (0.32)		0.01 (0.30)	-0.05 (0.31)
Native Hawaiian/Pacific Islander		-0.13 (0.64)	0.20 (0.75)		0.52 (0.69)	0.38 (0.72)
Controls included*	No	No	Yes	No	No	Yes
Constant	0.55*** (0.06)	0.56*** (0.04)	-0.05 (0.69)	0.47*** (0.06)	0.42*** (0.04)	0.30 (0.68)
N	4,103	4,230	4,103	4,084	4,209	4,084
Log Likelihood	-2,459.67	-2,586.49	-2,395.66	-2,553.86	-2,627.28	-2,498.83
AIC	4,933.34	5,184.98	4,881.33	5,121.73	5,266.56	5,087.66
* p < .1; ** p < .05; *** p < .01						

All observations weighted using nationally representative weights.

\*SES controls include years of education, gender, income, and age.

- Age is statistically significant but substantively trivial (medical: 0.01\*\*\*; SE 0.002. legal 0.005\*\*; SE 0.002)
- No gender effect for medical; being female is positively associated with willingness to contribute to forensic biobank
- No education effect
- No income effect

**Table 4: Logit regression results: support for government funding of medical or forensic biobank, GKAP 2011**

	<i>Medical biobanks</i>			<i>Forensic biobanks</i>		
	(1)	(2)	(3)	(4)	(5)	(6)
Extremely liberal	0.60*** (0.21)		0.62*** (0.21)	0.34 (0.30)		0.35 (0.31)
Liberal	0.74*** (0.11)		0.70*** (0.11)	0.11 (0.15)		0.05 (0.16)
Slightly liberal	0.72*** (0.12)		0.64*** (0.13)	0.40** (0.19)		0.27 (0.19)
Slightly conservative	0.03 (0.10)		0.02 (0.11)	0.30* (0.17)		0.19 (0.17)
Conservative	-0.84*** (0.09)		-0.82*** (0.10)	-0.34*** (0.12)		-0.51*** (0.13)
Extremely conservative	-1.54*** (0.18)		-1.58*** (0.19)	-0.57*** (0.20)		-0.70*** (0.21)
Black		0.19* (0.10)	-0.05 (0.12)		-0.16 (0.14)	-0.18 (0.16)
Hispanic		0.77*** (0.10)	0.55*** (0.12)		0.01 (0.14)	0.10 (0.16)
Asian		0.50*** (0.16)	0.12 (0.17)		0.02 (0.22)	-0.17 (0.24)
Multiracial		0.16 (0.30)	0.09 (0.32)		-0.22 (0.41)	-0.17 (0.42)
Native Hawaiian/Pacific Islander		0.43 (0.65)	0.71 (0.82)		0.73 (1.26)	0.38 (1.27)
Constant	0.39*** (0.06)	0.20*** (0.04)	1.23 (0.79)	1.93*** (0.08)	1.92*** (0.06)	0.33 (0.75)
N	4,060	4,179	4,060	4,085	4,205	4,085
Log Likelihood	-2,406.99	-2,618.91	-2,343.26	-1,466.00	-1,532.88	-1,404.70
AIC	4,827.97	5,249.82	4,776.53	2,945.99	3,077.76	2,899.39

All observations weighted using nationally representative weights

\*SES controls include years of education, gender, income, and age.

- Respondents with BA or MA are statistically but not substantively more likely to support funding for forensic biobanks.
- No gender effect
- Older respondents are statistically but not substantively more likely to support funding for forensic biobanks.
- No income effect