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SPACE-RELATED PUBLIC OPINION POLLS: A SURVEY, 1988-2004

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This paper concerns public opinion on the subject of space exploration, and whether that opinion has been misrepresented through manipulative or leading questions in those polls. The range of polls covered here includes everything from humans to Mars down to UFOs (which, in my opinion, are getting an alarming amount of attention from pollsters). Along the way, I'll be discussing the relevance of my findings on these topics to national space policy -- particularly in terms of how trends seen in these polls can create opportunities for exploration advocates to influence the national dialogue on space exploration. Finally, I will tie in an informal survey I conducted over the Internet, in terms of its relevance to poll manipulation.

Let me start out by giving the results of one survey question that shocked me tremendously -- and which may or may not shock readers of this paper, depending upon their opinion of the general public. In 1999, a Time/CNN poll asked 1,016 adults across the United States, "As far as you know -- does the Earth revolve around the Sun, or does the Sun revolve around the Earth?" Now, of course, anyone reading this knows the answer; I would have figured that the average adult, minus an aberrant one or two percent, would have as well. Amazingly enough, however, a full 18 percent of respondents said that the Sun revolves around the Earth, with another three percent deciding not to display their ignorance by responding that they had "no opinion.". If one were to take these results and extrapolate them out to the population at large a full 56 million people would be misinformed about one of the most basic facts in the study of astronomy -- a fact which is frightening in the extreme.

Thankfully, one survey doesn't really prove anything, and certainly can't show an emerging trend. What's really unfortunate, however, is that this wasn't the only survey I discovered which showed that the average American really knows very little about astronomy, space exploration, etc. Some of the other responses that stood out included:

In 1989, Gallup asked 1,253 adult Americans, "Do you happen to know who was the first person to walk on the Moon?" A mere 20 years after the landing itself, only 39 percent of respondents correctly identified Neil Armstrong. In that same survey, another 41 percent were unable to identify the event in question when read the quote "That's one small step for man, one giant leap for mankind."

In a 1990 survey of 1,200 registered voters, Rockwell found that only 18 percent correctly pegged NASA's funding as 1% of the federal budget that NASA's; a full 13 percent thought NASA ate up 20% of federal dollars, and another 9% thought it accounted for half or more of all federal expenditures. Of course, that's a much more obscure question than those above, but I think it does a good job of illustrating the state of the knowledge base the general public is drawing on when it forms opinions related to space exploration.

So what's the point of dragging these ridiculous results up, besides making the average Joe look bad? I actually have two points. The first is that space exploration advocates have an immense opportunity to educate the common citizen on the subject of space exploration in general and Mars missions in particular; and while that's something that a lot of the people reading this may already realize, it never hurts to remind people. My second point is less well-known: it's that, at some level, it may not even matter whether pollsters are actively or passively structuring their questions so as to manipulate the public; the public may just be clueless enough to do the job itself.

Setting aside that possibility for a moment, let's contemplate what we'd need to find in order to show that poll questions have indeed been manipulative, and/or have misrepresented the public's true feelings about space exploration. First, we'll look to see whether there's a consensus on a given subject among the polls I've studied. If there is, and there are obviously neutral questions which side with that consensus, then obviously the public's true opinion has been conveyed. If a consensus exists and neutral questions oppose it, then we'll need to look at whether the questions that generated the consensus were indeed leading, and if so whether or not responses seem to follow that lead. If no consensus exists on a given subject, we'll want to determine if one side or the other is heavily loaded with leading questions, and again if those leads were followed; if so, then we can assume that public opinion has indeed been misrepresented. Finally, if both sides are found to have a number of leading questions that are being followed, our conclusion is that the public doesn't really know how it feels, and that public opinion data in that area should be considered tainted and not fit for general use.

That in mind, we can now proceed through our list of topics. I've picked these because either a given topic received a lot of attention in my pool of questions, or because a less-discussed topic has distinct relevance to a major topic.

First among these topics, of course, is Mars exploration. Pleasantly enough, at least for our purposes, the public seems to be in agreement that, generally speaking, sending humans to Mars is a good idea. Of the 31 questions I found that asked specifically about whether to send humans to Mars, 23 of them -- a nice healthy 74 percent -- showed support for the idea. A prime example, and an excellent unbiased question for our litmus test, came from a 1996 survey of 1,000 adult Americans conducted by the University of Connecticut's Roper Center Institute for Social Inquiry, where 67 percent of respondents indicated support when asked "Would you favor or oppose sending a US manned mission to Mars?". Only two of the 30 demographic sub-categories listed with this particular survey's responses -- those without a high school diploma and those over 70 years of age -- opposed the idea. Meanwhile, the majority of the other questions in which people opposed sending humans to Mars were those which included a price tag, expressed in absolute dollars -- a mitigating factor for the dissent. Perhaps the most convincing reason to believe that public opinion has been accurately represented here is the fact that even those questions which asked whether it would be a good idea to conduct a joint mission with the Soviet Union, back when it still existed, were gung-ho for Mars: a whopping 71 percent of the 957 adults surveyed by Time magazine in 1988 gave a positive response when asked "Do you think it would be a good idea or a bad idea for the United States and the Soviet Union to undertake cooperative efforts in space -- such as going to Mars?".

Why, then, haven't proponents of human Mars missions been able to get anywhere with their ideas? For the most part, that's a question that must wait until other pieces of public opinion are

explored; for the time being, though, it's worth noting that while majorities of respondents do still favor humans to Mars missions, the margins by which this support is being expressed have dropped sharply in the past two years. Whereas majorities such as the 71 percent favoring a joint US-Soviet mission were not uncommon in the late 1980's and early 1990's, an Associated Press survey of 1,034 adults in July of 2003 put support for crewed Mars missions at a mere 49 percent plurality; likewise, a CBS/New York Times poll of 1,022 adults in January 2004 had proponents and opponents of humans to Mars running neck-and-neck at 48 percent to 47 percent.

The public mind appears to be less settled on the issue of probes being sent to Mars. While every time people were asked whether they were following Mars probes or had seen images returned from them, the answer was that they had paid attention. The same sort of unanimity was nowhere to be found in the 11 questions where people were asked explicitly whether they supported current or future Mars probes; four of those questions, or 36 percent, found people opposed to the probes. Given that one of the primary objections to crewed missions is their cost, one would expect the same to be true of cases where majorities opposed probes, and for our discrepancy to be explained by leading questions on that topic.

Strangely enough, real confusion springs up here, as is illustrated by two conflicting responses on the same mission: Mars Sojourner/Pathfinder. While Fox News found that 42 percent of 901 registered voters surveyed in 1997 -- a plurality in this case -- said that the Pathfinder mission was worthwhile even after it noted that NASA spent \$226 million on the project, an NBC/Wall Street Journal survey of 1,002 adult Americans taken two weeks later found a majority of 49 percent of respondents saying that the Sojourner project was not worthwhile after being told that its total cost was \$267 million. To make things even more strange, Fox asked the more leading question: "NASA spent 226 million taxpayer dollars for the Mars Pathfinder program. Do you think it was worth it or not?" Almost equally surprising, a 1999 CNN/USA Today poll of 1,037 adult Americans found 56 percent of its respondents saying yes when asked "Do you think that the federal government should or should not continue to fund efforts by NASA to send unmanned missions to explore the planet Mars?". Given that both sides of the argument contain leading questions -- and that the most leading question in the bunch was not followed -- we are basically forced to conclude that, from this sample at least, public opinion regarding Mars probes cannot be accurately determined. As a corollary, the fact that leading money questions appeared on both sides of the argument suggests that money may not be as big of a factor in the public's approval of a program as one would first guess.

Given that money may be a hugely influential factor in any decision on space exploration, it's imperative that exploration advocates solve the ambiguity raised by the issue of Mars probes, to determine if the public has truly set feelings about money and space. Of the 140 questions concerning funding for various space projects or the space program in general, a surprisingly high 101 responses -- 72 percent -- came back indicating that a majority of respondents wanted funding levels to continue untouched or be increased. Digging a touch deeper, we find that only two of those responses showed a plurality supporting a budgetary increase. Given that the responses which indicated support for space funding were peppered with neutral questions, such as CBS asking in a 1999 poll of 1,165 adults "Are we spending too much, too little, or about the right amount on space exploration programs?", we can conclude that the public likes the status quo on funding of space, and that its opinion on the subject has not been manipulated.

The truly interesting finding in regards to the public's feelings on funding, however, comes when

one compares cases where funding levels were stated in absolute dollar figures versus those where costs were stated as a percentage of the federal budget. A total of 16 questions mentioned millions or billions of dollars, either as something NASA proposed to spend or something that could be cut from the NASA budget; in only four of them did the respondents continue to support the funding in question. Even there, the support was tenuous -- space exploration won out over an increased military budget 51 to 49 percent in a survey of 1,000 adults conducted in 1990 by Americans Talk Security, and support was shown for the Mars Pathfinder probe with the 42 percent plurality found by Fox in the matter of Mars Pathfinder. Conversely, all four times that funding levels were expressed as percentages of the federal budget, respondents supported the idea in question. In fact, in one of those cases -- a 1994 CBS survey of 978 adults -- expressing the cost as a percentage even wiped out the "billion dollar voodoo" (i.e. the propensity for attitudes to turn negative almost instantly when the word "million" or "billion" is mentioned). Given the question: "Currently we spend close to one percent of our national budget -- that is, \$14 billion -- on space exploration programs. Do you think we should be spending more than one percent of our budget on space exploration, less than one percent, or is that about the right amount?", 44 percent supported that level of funding, and another 12 percent supported increased funding. Obviously, public opinion is very strong on this issue, and has not been the subject of any misrepresentation.

Perhaps the most significant poll on the issue of absolute dollar figures versus percentages was done by The Space Foundation in June and July of 2004. While there are multiple polls showing a lack of support for the Moon-to-Mars program, most of which mention its cost in absolute dollar figures, The Space Foundation was able to get 67 percent of its respondents to support the program, while having 63 percent of respondents support the entire 2004 NASA budget request either as submitted, or with some increase. Compared to the relatively neutral ABC News/Washington Post survey of 1,036 adults this January, which found 62 percent of respondents opposed to the program, or the blatantly biased Time/CNN survey of 1,003 adults done at the same time, which found 61 percent of respondents opposed to Moon-to-Mars, The Space Foundation's poll was so successful that it bears examining all three polls, to determine what exactly caused the swing.

Since it's the easiest to analyze, we'll start with the Time/CNN poll: "As you may know, President Bush has proposed spending billions of dollars to send a manned mission to the moon and eventually to Mars. Do you favor or oppose this proposal?". Red flags spring out all over the place: the mention of billions of dollars -- especially without an estimated number of billions, which would constrain the respondent away from the high hundreds of billions -- the incorrect description of the plan; the lack of rebuttal from supporters of the program; even the association with President Bush (who apparently is the kiss of death, as all five of the polls mentioning him show opponents of space exploration triumphing). Obviously, this poll is a model for how not to write a question that will generate support for the space program.

Moving along the spectrum is the ABC News/Washington Post question: "A program has been proposed to establish a manned base on the Moon and eventually send astronauts to Mars. Supporters say it would increase scientific knowledge and produce technology that will help people here on Earth. Opponents say it would cost hundreds of billions of dollars and take money away from other programs. Considering the costs versus the benefits, would you support or oppose a program to establish manned bases on the Moon and eventually send astronauts to Mars?". This question is much better: it accurately describes the program; it gives supporters of

the program not only a say, but the first say in the question; and it keeps the Bush stigma out of the picture. Why, then, did it generate so much opposition? Just as our discovery about absolute dollar figures predicts, the fact that it says "hundreds of billions" kills it on the spot.

Finally, there's The Space Foundation's question: "This year a new plan or goal for space exploration was announced. The plan includes a stepping-stone approach to return the space shuttle to flight, complete assembly of the space station, build a replacement for the shuttle, go back to the Moon, and then on to Mars and beyond. If NASA's budget did not exceed one percent of the federal budget, to what extent would you support or oppose this new plan for space exploration?...Strongly support it, support it, neutral, oppose it, strongly oppose it." Looking at this question, we can see that it thoroughly describes the program; it gives the naysayers no chance to voice opposition; and it talks about NASA's budget as a percentage of federal expenditures. Since we saw from the ABC News/Washington Post poll that letting both sides of the question have a say makes little difference, we can conclude that the framing of the NASA budget as only one percent of the federal budget made all the difference.

The implication here is obvious: supporters of the Moon-to-Mars program, or any space exploration program for that matter, must do everything within their power to ensure that budgetary debates focus on percentages, not dollar amounts. Frankly, I feel certain that if Moon-to-Mars had never been painted with the "one trillion dollar" brush, and had instead been pointed to as less than one percent of the federal budget, NASA's funding bill would already have cleared Congress, and the public would be excited about getting such a great new space program for so little money.

Even if the "million/billion" hurdle can be cleared, another obstacle to getting proper funding rears its head quickly with another issue that raised itself frequently in my question pool: whether the public would rather fund space exploration or other government programs, especially domestic ones such as health care, if given an explicitly choice. Even the ratio I found of nine responses supporting space to 22 responses supporting other programs -- which translates to a 72 percent preference for other programs, a very strong preference -- is misleadingly supportive of the space program. Two of the nine responses asked if space was a good long-term investment, or something we couldn't afford given all of our problems here on Earth; the problem there is that, as Social Security and Medicare show us, the federal government is terrible at long-term investments. Three more responses that swung for space put it up against unpopular programs: one against food stamps, another against welfare, and the last against the military -- a battle which space exploration only pulled off 51 percent to 49 percent. Given that a large portion of the questions which showed support for programs besides space exploration took the basically neutral form of the Associated Press' January 2004 survey of 1,000 adults: "On the whole, do you think our investment in space research is worthwhile or do you think it would be better spent on domestic programs such as health care and education?", it's obvious that the general public has a very distinct preference for spending their dollars on domestic programs instead of space exploration, and that once more, the public's opinion is not being misrepresented.

This preference carries a huge implication for NASA funding, when one considers the Congressional committees from which NASA's funding originates. In both houses, NASA funding comes from the Appropriations Committee's Veterans Affairs/Housing and Urban Development and Independent Agencies subcommittee. These placements put NASA in direct

competition with exactly the sort of programs it competes the most poorly against -- given, for example, a choice between a budget increase for NASA or paying for a new VA hospital, the committee will fund the VA practically every single time, because its members know that their constituents would rather see funding for health care instead of space exploration. Since the level of funding a program has coming out of committee is heavily influential in what its final funding levels look like, NASA is playing with a built-in handicap when it comes to getting money out of Congress. Keeping that in mind, supporters of Moon-to-Mars and other space programs should throw some of their Congressional lobbying efforts into getting a change of committee for NASA. While none of the other subcommittees that NASA could reasonably attempt to place itself under are terribly appealing, it would be interesting to gauge Congressional reaction to breaking the Independent Agencies piece of the existing committee into its own committee. This would be excellent for both sides -- NASA would drop a large chunk of its funding handicap, and more committee seats would be created for Congresspeople, who are always eager for committee slots.

The public's support for other government programs over NASA becomes quite ironic when taken in the context of the public's opinion of NASA generally and its recognition of the benefits NASA provides. Of 17 questions which had respondents rate NASA's job performance -- such as the Pew Research Center's 1998 survey of 1,007 adults, which asked: "Do you have a very favorable, mostly favorable, mostly unfavorable, or very unfavorable opinion of NASA?" -- 16 responses came back with a majority rating NASA favorably. Every one of these questions was neutrally phrased, too, so we can firmly say that the public thinks NASA is doing a good job. On top of that, 15 of the 16 questions which asked if NASA brought benefits back to everyday society came back with positive responses; in the six cases where questions specifically asked if the benefits from NASA justified its costs, all six responses indicated that it had justified itself.

The irony is magnified even more strongly when taking into account the public's feelings on the Space Shuttle and space stations -- both generally and the International Space Station in particular. Of the 22 questions asked about the Space Shuttle, 20 responses came back in support of the program. In fact, the Space Shuttle is so popular that when Time/CNN asked 1,0003 adults "[Should the government] spend several billion dollars for another Space Shuttle to replace the Columbia?", a plurality of 49 percent agreed that the government should spend the money -- overcoming the "billion dollar obstacle." Admittedly, that result may have been somewhat skewed by the fact that the question was asked five days after the explosion of the Columbia, while most Americans were still in shock over the incident and were still in a "rally 'round NASA" mood (all 16 questions which asked about something in light of the crash came back supportive of NASA). Even so, the fact that the Space Shuttle was even able to come close when absolute dollar figures were used, let alone secure support for fresh funding in the face of the use of the word "billion" shows just how strongly the public supports the Shuttle. Meanwhile, 13 of the 15 questions asked about space stations came back in support of them. The positive responses included scenarios where the US would put up its own station as well as internationally cooperative scenarios, with the vast bulk of the questions being as obviously neutral as the 1988 Associated Press/Media General question posed to 1,223 adults: "Do you think the United States should build a space station, or not?", which showed a 55 percent to 34 percent support rate for those with a preference.

With those sorts of numbers in hand, it's obvious that the public's support for NASA in general and the Space Shuttle and space station programs is solid and genuine. What's not obvious is

why the public would shun such a well-loved agency...until another issue is analyzed, that being whether members of the general public would themselves like to travel in space. The data here is stark: 22 times questions were posed like the National Science & Technology Medals Foundation's survey of 1,000 adults, which asked "If you had a chance to go into space yourself, do you think you'd take it?"; 21 times the answer came back a definitive no, with the one other response being a draw. Again, given how distinct the response is to such a neutral question, we know that the public genuinely does not like the idea of personally being involved in space travel...and since almost all of the public will at some point be the beneficiary of other government programs such as health care or education, it makes perfect sense that they would prefer to see the programs they'll actually use get funded over one they won't. Unfortunately, if my deduction here is right, there is little we can do to help swing the public's funding preference towards NASA, shy of convincing them that travel in space would be something they'd actually want to do. If nothing else, I think it emphasizes even more how badly we need to get NASA out of its current Congressional committees.

One area where it may be feasible for NASA to align itself with the public's opinion, however, is in the area of international cooperation. Nineteen questions asked whether America should partner with other countries on space projects such as a space station or a crewed trip to Mars -- and 18 of the responses came back in support of international cooperation. This held especially true when a cost was put in front of a proposition for international cooperation. For example, in a 1994 study Newsweek asked 751 adults this question: "Scientists estimate it would cost \$50 billion over 10 years to put a person on Mars. Do you think the United States should undertake a solo manned mission to Mars, undertake a manned mission to Mars only with other nations to share costs and expertise, or not undertake a manned mission to Mars?"; 52 percent of respondents went with the international requirement, while only four percent advocated a solo mission. Barring a dramatic change of opinion in light of the war in Iraq and the general isolationist feel that some Americans are developing these days, the statistics show us that, once more, we've found a well-defined, properly represented public interest. As for NASA using this interest to boost its own image, obviously, international coordination has its drawbacks -- I need say no more than "International Space Station" -- but given that this is a case where positive change is possible, it's something that NASA management ought to seriously consider.

The final topic from my question bank is a broad one, which ranges from serious to utterly ludicrous: the question of life beyond Earth. Obviously, the public is quite interested in this topic: a total of 91 questions were asked about life beyond Earth, making it one of the most popular topics in my study. Questions were all over the map -- everything from the frequently asked, "Do you think there is life on Mars?" to a Time/CNN survey in 2000 which asked 1,564 adults "If beings from another planet asked you to come aboard their spacecraft, would you or wouldn't you?". Overall, respondents seemed to have little faith in life's existence beyond Earth - 36 of the 50 questions which were asked about intelligent life elsewhere in space showed a disbelief in the proposition, and eight of the 12 which asked simply whether some form of life existed in space came back negative as well. Amazingly enough, given the amount of attention which the media has devoted to the topic, people even expressed a disbelief in UFOs -- 12 of the 19 questions asked on the subject came back negative. In fact, the only area where people seemed to believe in alien life forms was when they were asked if the government was covering up knowledge of their existence -- eight of the 10 responses on the topic were pro-coverup conspiracy.

There's an interesting possible explanation for the sudden swing to belief in ETs when asked about a government coverup that is supported by a look at the other life-in-space questions: if you ask people very general, vague questions about life, they are considerably more likely to believe in it than if you pin them down to details on the subject. For example, Louis Harris and Associates asked 1,008 adults in 1996 two questions: the first was "Do you personally believe that there is intelligent life somewhere in space, or not?"; the second question asked "Do you personally believe that there is intelligent life somewhere on the planets of the solar system?". Fifty-three percent of respondents said there was life in the universe; only 40% thought it was in the solar system. A less comparable, but distinctly more dramatic, example comes when comparing a general question, such as Gallup's 1996 survey of 1,000 adults which asked "Do you think there is life of some form on other planets in the universe or not?" to a specific question, such as another question asked by Gallup of 1,018 adults in 1999: "Do you think there are people somewhat like ourselves living on other planets in the universe or not?". Seventy-two percent thought that there was life somewhere in the universe; only 41 percent thought there were humanoid beings out there.

So what are the implications for the space program here? The first, and most obvious one, is that the public is more likely to support space exploration when it's framed in terms of the search for life. This gives Mars missions, particularly with the results of the current rovers, a distinct advantage over, say, unmanned probes to the gas giants; people can get excited about fossils on Mars a lot easier than they can spectrographic readings of Jupiter. To NASA's credit, they've done a good job of keeping the search for life in the forefront of any mission they can, particularly so with the Mars missions.

The other implication of these findings is a less serious one: it looks like we're stuck with the pseudoscience kooks for a while longer. Since those folks and the public's belief in them thrive on areas with little specific information, and since it's going to be a very long time still until the balance of knowledge versus open questions shifts towards the former in regards to space exploration, there will be room for believers in things which we all know cannot possibly be true for the foreseeable future. On the bright side, maybe we can at least shut up the "face on Mars" people when humans finally get there and can show it's just another rock.

Given all of those results, I would say that the answer to the question of whether public opinion polls on space over the last 16 years have misrepresented public opinion is a solid no. Even though I found roughly 32 percent of the questions asked to be potentially manipulative -- they were leading questions, they made a proposition without letting the opposition counter, they made references to unpopular ideas like raising taxes, etc. -- it appears that, where the public has an opinion on a given topic, that opinion was demonstrated to be genuine by the responses to neutral questions backing it up, and/or the fact that the demonstrated opinion ran counter to the slant of the manipulative questions.

As for whether public opinion polling can in fact be manipulated, however, I would say that the answer is a distinct yes -- because if you know in advance what sort of questions are likely to trigger responses one way or the other from the general public, your poll simply needs to ask questions which take advantage of those triggers. I had hoped that the online survey I conducted would illustrate this point clearly; unfortunately, it appears to have done a better job of illustrating my lack of formal training as a pollster, as its results are suggestive of support for my original hypothesis, but are muddled by some of my choices of wording, as well as the way I

presented the poll. Keeping that in mind, let me describe my methodology. In conducting it, I actually had three separate polls: one which attempted to lead people away from the cause of space exploration; one which acted as a middle ground, my attempt at a control; and a third which attempted to rally support for space exploration. I intentionally did not tell people that they were going to be randomly given one of three polls, or that these polls might be slanted in one direction or another; the goal, obviously, was to see if I could manipulate the way they voted. For convenience's sake, I'll be referring to the negatively skewed poll as poll A, the control one as poll B, and the positively skewed poll as poll C.

My first question -- "Do you feel that space exploration in general is a worthwhile endeavor for humanity?" -- was kept the same across the surveys; it was intended to make sure that the results weren't too badly skewed by my getting a bunch of space advocates or anti-exploration zealots taking a particular poll. Additionally, since I recorded individual respondents' vote patterns, I will be looking later on to see if there are correlations between, for example, people who support space exploration and those who may have gone against my manipulative tactics (i.e. whether someone who strongly supports space exploration would be supportive of the Moon-to-Mars program despite the mention of an absolute dollar figure). I say "will be looking" because, unfortunately, I had a hard time drawing people to the poll, and it was only as of Wednesday night that I'd ensured statistical significance by getting at least 30 responses for each poll. For those of you who might be interested in more detailed analysis later -- or for that matter if anyone wants to see my raw data -- just send me an e-mail, my address is in the conference guide. In any case, the result for this first question showed that my respondents were at least in the same ballpark as the general public; those who said that space exploration was either "definitely worthwhile" or "worthwhile" made up 70 percent of poll A's respondents, 81 percent of poll B's respondents, and 92 percent of poll C's respondents. While poll C's number is surprisingly high -- and even more shocking when realizing that a whopping 70 percent said that space exploration was "definitely worthwhile" -- it may be explained by people changing their answers after reading the full poll, since I listed all the questions on one page. For those of you who may be thinking that that sort of a leaning in such a neutral question shows that my data is invalid and not worth discussing, keep in mind that this was a preliminary study, done to determine whether a more rigorous study was worthwhile; if the results of this study are proved invalid at a later date, so be it.

Moving right along, my second question served two purposes. One was the same purpose as the first, only at a more specific level: I was attempting to weed out people who might be strongly partisan for or against the Moon-to-Mars proposal. The second purpose was more mundane: if I was going to ask questions about the program, I had to introduce it. Thus, I again asked the same question across all three polls: "A proposal has been made to establish a Lunar base, and eventually send astronauts to Mars. Generally speaking, how do you feel about this idea?". Here, poll A showed 47 percent in support of the idea, with another 23 percent being neutral; poll B had exactly half show support, with another 31 percent being neutral; and poll C came in with 70 percent in support and another 27 percent neutral. The interesting thing to note here is that support declined across the board, at roughly the same rate; what this suggests, I'm not entirely certain.

My third question is where things begin to get truly interesting. For poll A, I asked: "Supporters of this proposal cite dramatic scientific returns, and the development of products that would be useful back on Earth. Opponents cite staggering cost estimates near one trillion

(\$1,000,000,000,000) dollars. Considering the potential costs of this mission versus its potential benefits, would you support or oppose this program?". For poll B, my control, I asked: "Supporters of this proposal cite dramatic scientific returns, and the development of products that would be useful back on Earth. Opponents cite the potentially large costs of the program. Considering the potential costs of this mission versus its potential benefits, would you support or oppose this program?". Finally, with poll C, I asked: "Opponents of this program cite potentially high costs for this program. Supporters note that the scientific returns, including new technology that would be helpful on Earth, would be staggering, and note that the budget increases being requested represent roughly one-tenth of one percent of current federal discretionary spending levels. Considering the costs vs. the benefits of this program, do you think this is a worthwhile expenditure of federal dollars?". The goal with these questions was to see if mentioning a dollar figure versus a percent, as well as emphasizing cost or benefits, did make a large difference. Unsurprisingly, only 44 percent of poll A's respondents showed support; meanwhile, 56 percent of poll B's respondents showed support, and 73 percent of poll C's respondents were supporters. Taken alone, these figures prove my point; unfortunately, when compared to the general levels of support for the program, it appears that the mention of a dollar figure versus a percentage makes little difference. Again, I would speculate that the overall levels of support shown may have been unduly influenced by the specifics later in the poll, with people changing answers for early questions after reading later ones.

My fourth question was designed to gauge support for space against domestic programs, an area where we've seen that space does poorly. In poll A, I asked: "Would you feel this program was worthwhile if you were told it was likely to take money away from other government programs, such as veterans benefits, child welfare services, or agricultural subsidies?"; in poll B, the question was: "Would you feel this program was worthwhile if you were told it might take money away from other government programs?"; finally, in poll C, I asked: "Would you feel this program was worthwhile if you were told that it was not likely to take money away from other government programs, but instead come out of NASA's existing budget?". Forty-one percent of poll A's respondents continued to show support; forty percent of people answering poll B showed support; and 81 percent of respondents to poll C showed support. The dramatic swing shown among respondents to poll B comes out as perhaps the first clear truly indicator that the way a question is presented can be very influential on the level of support shown for a given program.

Fifth in line was another cost-benefit question, this time on the topic of human versus robotic exploration. For poll A, I asked: "Do you feel it is a better investment of scientific dollars to send robotic probes, which typically cost hundreds of millions of dollars, or manned missions, which typically cost billions of dollars?"; for poll B, I asked "Do you feel it is a better investment of scientific dollars to send robotic probes or manned missions?"; and for poll C, I asked: "Do you feel it is a better investment of scientific dollars to send robotic probes, which are cheaper but provide limited scientific return, or manned missions, which are more expensive but provide orders of magnitude more scientific return?" The results here were interesting. Poll A saw a 56 to 23 percent ratio for robots over humans, with the rest neutral; this is what we should expect, given the cost choice. Poll B seemed to reflect the divide we all know exists generally between advocates of humans and robots: 47 percent favored robots, 38 percent favored humans, and the rest were neutral. In poll C, meanwhile, only 11 percent showed support for robots; 35 percent supported humans; and the remaining 54 percent were neutral. Compared to poll A, poll C seems to indicate that people have some level of willingness to pay more for better results, but that

without a reference point for how great the difference in cost is, they're unsure if it's truly worthwhile or not. This would appear to support my conclusion that the way costs are framed can be very influential in how people feel about a program, though in the next iteration of this study it should be noted in poll A that humans bring back more science than robots in order to better isolate the effect of the reference to "millions" or "billions" of dollars.

Finally, my last question concerned space prizes, with emphasis again being on the way dollar figures influence results. In poll A, I asked "If you were told that NASA was considering spending money on prizes for private achievements in space -- such as a \$1 billion prize for landing a man on the Moon -- would you feel that was worthwhile?"; for poll B, I asked "If you were told that NASA was considering awarding prizes for private achievements in space -- such as a \$30 million prize for a soft robotic landing on the Moon -- would you feel that was worthwhile?"; and for poll C, my question was "If you were told that NASA was considering awarding prizes for private achievements in space -- such as a \$30 million prize for a soft robotic landing on the moon -- in order to save on the costs of developing these missions themselves, would you feel that was worthwhile?". Not surprisingly, given the use of the dirty word "billion," 59 percent of respondents to poll A disapproved of the idea. A 66 percent majority came out in support of the idea in poll B; I would credit this to the relatively small dollar figure being attached to the concept. Finally, poll C backed up the idea that a smaller dollar figure will help bring about support; 62 percent of respondents there liked the idea, with an additional 22 percent being neutral; it is surprising, however, that support was not higher, given the group's generally higher levels of support and the fact that the expenditure was pitched as a potential savings. One possible explanation for this which would have relevance to the way space exploration advocates attempt to frame things is that, while inadvisable generally, the use of the word "million" can be mitigated by putting a smaller number in front of it.

Obviously, further study should be done to verify my findings, both from my own poll and from the national polls. In the meantime, though, I hope that this research can prove useful for advocates of space exploration -- whether it be in the context of mitigating the negative impact of an unfavorable poll, in helping to select poll questions for any studies that might be sponsored by sympathetic groups, or in the way that points are presented when doing public outreach or education.