The Prayer of Faith Shall Save the Sick: Can Prayer be Proven?

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Dr. Bishop interests include ethics, questions at the interface of philosophy and medicine, and the role of spirituality in medicine.

Is any among you sick? Let him call on the elders of the church, and let them pray over him, anointing him with oil in the name of the Lord; and the prayer of faith will save the sick man, and the Lord will raise him. ***James 5:14-15 Revised Standard Version***

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We cannot be storytellers of our illness if our culture is deprived of any useful contents for that purpose; this is the tragedy of an exclusively technological culture.

--Roberto Mordacci and Richard Sobel

Introduction

Prayer predates science and medicine, at least as medicine is practiced today. In fact, at one point in history, prayer was part of the medical endeavor. Every major religious tradition has prayer and meditation as a cornerstone of its belief system. Prayer is used for worship, meditation and contemplation, as well as petition. Religious and spiritual traditions refer to the latter as intercessory prayer. The idea behind this form of prayer is to ask divine intervention into the occurrences of everyday life. Clearly people with religious or spiritual faith will turn to prayer when faced with crises, including medical crises. (Conway 1986-6; Cronan et al 1989; Poloma et al 1991; Saudia et al 1991) They make petition hopeful that the divine will intervene to help with their condition.

Many people describe themselves as religious. (Gallup 1990) Some use religious and spiritual beliefs to help them to make serious medical decisions. (Matthews, McCullough et al 1998; Gordin 1993; Hamel et al 1994; Sugarman 1992; King, Speck et al 1994) In addition, several studies have shown that many people turn to prayer, as well as alternative or complementary therapies when confronted with grave diagnoses. (Bearon and Koenig 1990) Moreover, several have shown the benefits of religious faith to health and longevity. (Ferarro et al 1991; Harris, Dew et al 1995; Idler et al 1995; Oxman et al 1995; Pressman etal 1990; Matthews 1998; Strawbridge et al 1997) Many people pray for specific intervention only when the situation reaches a threshold of danger. Some do not turn to prayer for the 'small' things, but will for the 'big' things, like intractable pain or a grave or terminal diagnosis. Until recently, few studies evaluating a correlation or causal relationship between prayer and healing had been performed.

In contemporary medicine two popular strains of thought have come together to create the current interest in the empirical evaluation of prayer. The first is, of course, the push to ground clinical medicine in what has been called Evidence Based Medicine (EBM). This movement seeks examine populations of patients to assess the outcomes of various diagnostic and therapeutic interventions so as to be able to say which interventions have the best evidence of safety, efficiency, and efficacy. This information is then applied to the particular patient that sits before the clinician in the practice of medicine. The second strain in contemporary thought is the increasing drive to be sensitive to the cultural and religious beliefs of the patient even, and perhaps especially, when those beliefs are contrary to the evidence garnered by medicine. These two strains of thought have intersected recently and there has been an ever growing push to assess one particular spiritual belief common among all religious traditions, namely prayer, and to examine the evidence for the efficacy of prayer. In these pages, I will briefly examine the evidence presented by various investigators as to the efficacy of prayer as it relates to various clinical outcomes. I shall then take a philosophical step away from the science to examine the epistemology of science—that is, how we know something in scientific ways—as distinguished from religious epistemologies, examining the roles that each epistemology plays in human questioning and discourse, particularly in the clinical encounter.

The Evidence on the Efficacy of Prayer

A Compelling Anecdote

We all have heard of cases where the patient should have died but did not, or where widely metastatic carcinoma was found, but the patient went to a prayer meeting and the next time she went to the doctor, nothing was found. Perhaps some of us may have actually seen such cases. If you are like me in my scientific moments, you are skeptical of such stories. There is—there must be—a more compelling scientific explanation. The problem with these stories is that we are dealing with an "*n* of one." We are dealing with events that are unbelievable from the philosophical presuppositions of the scientific world-view and are not reproducible so as to be studied by our dominant methodology for knowing, namely the scientific methodology. I wish to present just such a case that appears in the literature.

> A baby girl, J.A., was born at an estimated gestational age of 27 5/7 weeks to a 36-year-old black female with a history of 3 previous miscarriages, insulin dependent diabetes, and hypothyroidism. The multiple previous fetal losses were due to the maternal presence of antinuclear antibody, a condition frequently associated with the diagnosis of systemic lupus erythematosus and known to interfere with a woman's ability to carry a fetus to viability.
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> To suppress this autoimmune condition, the patient had been treated with prednisone since the fourth week of gestation. On the day of delivery, she developed chorioamnionitis and the fetus was tachycardic. Labor was induced and a 1.030-kg female was delivered vaginally. She was blue and floppy with a heart rate of less than 100 beats per minute that was not increasing. Her skin was bruised and she had bilateral conjunctival hemorrhages. The baby was immediately intubated and treated with artificial surfactant, intravascular volume expansion, and sodium bicarbonate for severe metabolic acidosis.
>
> The baby's APGAR scores were 1 at 1 minute (heart rate <100 beats per minute [BPM]); 2 at 5 minutes (heart rate >100 BPM); and 4 at 10 minutes, 20 minutes, and 30 minutes (heart rate >100 BPM and adequate respirations). The first chest radiograph demonstrated a pneumothroax on the right, which was evacuated via needle thoracentesis. Although it was not the usual practice, due to the baby's extremely critical condition she was admitted to the neonatal intensive care unit on high-frequency oscillatory ventilation. An echocardiogram showed pulmonary hypertension with suprasystemic right ventricular pressures and right-to-left shunting through a patent ductus arteriosus.
>
> Despite maximal ventilator pressures (changes in pressure, 32; mean airway pressure, 22; fraction of inspired oxygen, 100%), the baby's oxygen saturation was very poor at 30% to 50% via pulse oximetry (normal 92%-100%). An arterial blood gas drawn from the descending aorta via an umbilical arterial line showed the following: pH, 6.95 (normal, 7.34-7.40); $Paco_2$, 82 mm Hg (normal, 35-45); Po_2, 23 mm Hg (normal 60-80); and HCO_3, 17.4 mmol/L, with a base deficit of 15.2 mmol/L.

The second chest radiograph showed reaccumulation of a massive pneumothorax on the right, and a chest tube was placed. The air recollected, and more than 2000 mL was evacuated emergently via thoracentesis, followed by placement of a second chest tube. A head ultrasound demonstrated a grade III intraventricular hemorrhage (IVH), defined as a hemorrhage into the lateral ventricles with ventricular dilation. The baby was heavily sedated and completely muscle-relaxed. She was hypotensive despite maximal infusions of the vasoactive drugs dopamine and dobutamine.

When the baby was 3:15 hours old, the parents were updated on her critical status, her failure to improve despite maximum medical therapy, and probable dismal neurologic outcome. With the concurrence of the medical staff, the parents decided to withdraw support from the baby. However, they asked for the baby to be baptized prior to doing so. To show respect for the family, the medical team retreated and no further therapies were initiated or withdrawn.

... The nurse's notes indicate that a chaplain was at the bedside praying with the parents when the baby was 3:40 hours old. When the baby was 4:15 hours old, the chaplain, both parents, the baby's nurse, and a respiratory therapist formed a prayer circle around the bed. The chaplain then prayed for the baby and baptized her.

The next entry in the nurse's notes, written 45 minutes later, reflected an increase in postductal oxygen saturation from 72% to 100% and an increase in Po_2 from 17 mm Hg to 357 mm Hg. The next blood gas, drawn when the baby was 5:40 hours old, showed a dramatic reversal of the baby's ventilator status, requiring reduction in the level of respiratory support. By 10:50 hours of life, the baby was stable enough to be moved to an incubator.

The baby weaned to continuous positive airway pressure on day 17 and to room air on day 21. She stopped theophylline (for apnea of prematurity) on day 46, when she had a postconceptional age (PCA) of 34 2/7 weeks. She had no chronic lung disease. Her feeds were started on day 12 and she advanced rapidly to full feeds on day 21, with no evidence of feeding intolerance. She had 1 episode of *E. coli* sepsis diagnosed on day 22, which was treated and resolved without difficulty. As a result of her grade III IVH, she developed posthemorrhagic hydrocephalus, for which a ventriculoperitoneal shunt was placed. When the baby was 34 weeks PCA, an ophthalmologic exam revealed retinas mature to zone 2 bilaterally, with no retinopathy of prematurity. She passed a brain stem auditory evoked response bilaterally. J.A. was discharged home on no medications and no oxygen at PCA 36 weeks, weighing 2742 g.

At her 6-month follow-up visit (PCA 3 months, 28 days), J.A. weighed 11 pounds, 13 ounces. She was cooing and reaching for objects, showing developmental skills appropriate for a 2- to 4-month-old infant. She is being followed by the high-risk neurodevelopmental clinic, and her latest visit was in October 1998, when her age corrected for her prematurity was 5 months. At that time, her weight and length were at

> the 25th percentile for age, and her gross motor skills were appropriate. At that visit, no deficits were identified that required treatment. (Cypher-Springer and Eicher 1999)

This case demonstrates what most people of faith traditions understand as evidence—a compelling story of a particular hopeless event that came out well. The possibility that J.A. should live was remote and, given the severity of condition, the length of time that she was hypoxic, the low pH, requirement of pressors, and the intracranial hemorrhage, it is not scientifically feasible that she should have lived. It is inexplicable that she should be at roughly a normal developmental level at five months of age corrected for prematurity. This infant is an "*n* of one." I will now turn to the scientific evidence for prayer.

Galton 1872

F.S. Galton looked at the efficacy of prayer in the 19th century. In 1872, he did a retrospective statistical analysis to examine the efficacy of prayer. He examined the longevity of the British royal family. Since the clergy and laity in the Church of England pray for the British royal family on a daily basis, Galton decided to look at the life expectancy of the members of the royal family. If anyone had sufficient prayer to establish a linkage between prayer and health, it would be the royal family. The data showed that men in the royal family who had attained their 30th year died at a mean age of 64.04 years between 1758-1843—three to five years younger than others examined. Galton concludes: "The sovereigns are literally the shortest lived of all who have the advantage of affluence. The prayer has therefore no efficacy..." (Galton 1872)

Galton was also a pragmatist. In 1872, he pointed out something that remains true today. "If prayerful habits had influence on temporal success, it is very probable... that insurance offices... would long ago have discovered and made allowance for it." (Galton 1872) The link between intercessory prayer and medical success is not clear, suggesting that prayer may be about something other than medical success. I shall return to this point later.

Joyce and Welldon 1964

In this study, Joyce and Welldon enrolled 40 patients with various forms of chronic arthritis and pair-matched them. The patients were assessed by their physician according to the Clinical State Scale and the Attitudinal Scale. Neither of these scales has been validated. The patients were then randomized into a prayer group that was prayed for by intercessors and into a control group, which was not prayed for. Neither the patients nor the physician's knew that they were participating in a prayer study. The prayer groups received prayer, both in groups of intercessors meeting once every two weeks, and on a daily basis for five minutes by the individual intercessors during the six-month trail.

There was a trend toward improvement in the evaluation of pair-matched participants, but the last nine evaluated countered these data. There was no statistical improvement in pre- and post-intervention scores when compared to pair-matched participants. This held for both the Clinical State scale and the Attitudinal scale. (Joyce and Welldon 1964)

Collipp 1969

In 1969, Planton J. Collipp published a study on the efficacy of prayer in a group of children with leukemia. The names of children were solicited from physicians treating the children.

Death was treated as the end point. The doctors were told that the children and their families were being studied to evaluate the response of the children and their families to the disease. Eighteen subjects were recruited. The names of 10 patients were randomly selected and these 10 served as the intercessory prayer group; the other eight served as the control group. The names of the 10 patients in the prayer group were given to 10 families in a protestant church. The prayer families were not told that they were part of a study on the efficacy of prayer. Each family received weekly reminders to pray for the child.

The physicians and parents answered a questionnaire at monthly intervals. The questionnaire asked whether the illness, the child's adjustment, and the family's adjustment were better, unchanged, or worse. After 15 months of prayer, seven children in the prayer group were alive and two in the control group. The difference in survival was at the level of 90% statistical significance. One child in the control group survived 11 years. If this subject is deleted from the statistical evaluations, the groups are different at the 95% level of significance. (Collipp 1969) This study did not control for severity of illness before the intervention. No pre-intervention statistical analysis of the differences between the groups was done.

Byrd 1988

In 1988, Randolph C. Byrd, a researcher at the University of California at San Francisco, published a study in which he randomized 393 patients into an intercessory prayer group and a control group (Byrd 1988). Fifty-seven patients refused to be a part of the study. The subjects were a series of patients admitted to the cardiac intensive care unit. There were no differences between the groups prior to the study. The prayer group received prayer from the intercessors, who were members noted to be active in protestant and Roman Catholic Churches. The intercessors knew the patients' first names, diagnoses and general condition. Each intercessor was asked to "pray daily for a rapid recovery and for prevention of complications and death, in addition to other areas of prayer they believed to be beneficial to the patient" (Byrd 1988). Prayers were directed to the Judeo-Christian God and continued until the patient was discharged from the hospital.

Of 29 study variables, Byrd found six endpoints that achieved statistically significant differences, including incidence of congestive heart failure [Intercessory Group (IG) 4% (8) vs. Control Group (CG) 10% (20) $P< 0.03$], need for diuretics [IG 3% (5) vs. CG 8% (15), $P< 0.05$], cardiopulmonary arrest [IG 2% (3) vs. CG 7% (14), $P< 0.02$], pneumonia complication [IG 2% (3) vs. CG 9% (17), $P< 0.005$], and need for intubation [IG 0% (0) vs. CG 6% (12), $P< 0.002$]. Multivariate analysis revealed a significant difference ($P< 0.0001$) between the two groups based on events that occurred after entry into the study. Byrd also created a severity score, dividing patients into good, intermediate, and bad categories depending on the events that occurred while in the CCU. Byrd's severity scale was created for the purposes of this study and has never been shown to be valid or reliable. He found a statistically significant difference in favor of the prayer group. Based on this study Byrd concluded that prayer was efficacious. (Byrd 1988)

Sicher, Targ et al 1998

Fred Sicher, Elizabeth Targ et al published the results of a distance healing study, which included prayer as a mode of distance healing. Distant healing (DH) is defined as a "conscious, dedicated act of mentation attempting to benefit another person's physical or emotional well-

being at a distance" (Sicher et al 1998). The study pair-matched patients with advanced HIV and randomized them into the study and control groups. Forty patients were recruited using fliers distributed to AIDS clinics and at AIDS-related events. Admission criteria required the participants to meet the CDC AIDS category C-3; that is, each participant had to have a CD4+ cell count < 200 or a history of at least one AIDS-defining disease (ADD). Subjects were pair-matched by age, CD4+ count, and number of AIDS-defining illnesses.

The patients were evaluated at enrollment for baseline CD4+ count, psychological distress as measured by the Profile of Mood States (POMS), physical symptoms as measured by the Wahler Physical Symptom Inventory (WPSI), and quality of life as measured by the Medical Outcomes Survey (MOS) for HIV.

Forty healers from various traditions and with a minimum of five years experience were recruited. These included healers from Christian, Jewish, Buddhist, Native American and shamanic traditions as well as graduates of secular schools of bioenergetic and meditative healing. The healers were randomly selected each week to focus the intervention on the study group. Thus, each subject in the trial had 10 different healers so as minimize any possible difference in healer effectiveness. Each healer worked on alternate weeks and treated five patients each.

The following results were found:

Medical Outcome	Treated (n=20)	Control (n=20)	Two-tailed p
Outpatient visits	185 (9.2 +/- 5.9)	260 (13.0 +/- 7.0)	0.01
Hospitalizations	3 (0.15+/-0.5)	12 (0.6+/- 1.0)	0.04
Days Hospitalized	10 (0.5+/-1.7	68 (3.4+/-6.2)	0.04
Illness Severity	16(0.80 +/-1.15)	43 (2.65+/-2.41)	0.03
ADD acquired	2(0.1+/-0.3)	12(0.6+/-0.9)	0.04
ADD recoveries	6(0.3+/-0.6)	2 (0.1+/-0.3)	0.23
CD4 change	31.1 +/- 54.9	55.5 +/- 102.0	0.55
Deaths	0	1	1.0
Change in POMS	-25.7 +/- 46.0	14.2 +/- 49.0	0.02
Change in MOS	0.2 +/- 0.8	-0.2 +/- 0.8	0.15
Change in WPSI	-0.2 +/- 0.6	0.1 +/- 0.9	0.31

The endpoints that reached statistically significant differences between the groups are outpatient visits, hospitalizations, days hospitalized, illness severity, ADD acquired, and change in POMS, all in favor of DH.

The authors of this study conclude that DH contributes to a global rather than a specific effect and that no mechanism has been identified. (Sicher, Targ et al 1998)

Harris, Gowda et al 1999

Harris, Gowda et al set out to reproduce the study done earlier by Byrd (Harris, Gowda et al 1999). To do so, they identified 75 intercessors, who were placed in 15 teams of five intercessors each. They were all Christian representing non-denominational (35%), Episcopalian

(27%) traditions, with the remainder falling into other protestant and Roman Catholic groups (38%). The intercessors were primarily women (87%) and their mean age was 56 years. The intercessors were instructed to pray for the patient by name and for a speedy recovery without complications.

The investigators hypothesized that, since prayer was offered for a speedy recovery and with no complications, the effects of prayer would not be detected in any specific clinical outcome. Since no validated and standardized statistical tool exists to quantitate severity of outcomes in critically ill patients in the CCU, the investigators devised a weighted and summed scoring system called the MAHI-CCU score. Since the APACHE scoring system and the Charlson scale were prognostic tools designed to predict clinical outcomes, the investigators felt that these tools would not summarize the CCU course of a patient. These instruments would not provide the granularity needed to capture efficacy of prayer. To this end, the MAHI-CCU scoring system was developed prior to the initiation of the study by the investigators. It is a continuous weighted scale that assigns points based on outcomes. For instance, if the patient developed unstable angina, she would receive one point. If she needed coronary artery bypass graft surgery, she was given three points; and if she died she was assigned six points. Cardiac arrest resulted in five points; thus, the more severe the event, the higher the points assigned.

During the trial period, a total of 1019 patients were admitted to the CCU. Six patients were awaiting cardiac transplantation and were not included in the analysis. The patients were randomized into the intercessory group (IG) (N=484) and into a control group (CG) (N=529). The patients who spent less than 24 hours in the CCU were removed because prayer would not have begun until the next day. These exclusions resulted in 466 subjects in IG and 524 in CG. Men and women were equally represented in both groups and the mean age in both groups was 66 years. There were no differences in severity of illness at admission and no difference in co-morbid conditions between the two groups. Both patients and staff were blinded as to who was and was not being prayer for, and none of the patients knew they were enrolled in the prayer study.

The results of the study showed that no single specific clinical outcome was different between the two groups. However, the MAHI-CCU scoring system results did reach statistical significance showing a positive difference in favor of the IG study group. The following data were reported:

Variable	Usual Care (n=524)	Prayer Group (N=466)	Percent Change	P
MAHI-CCU Score	7.13 +/- 0.27	6.35 +/- 0.26	-11	0.04
Unweighted MAHI-CCU	3.00 +/- 0.10	2.70 +/- 0.10	-10	0.04
Length of CCU Stay	1.23 +/- 0.09	1.12 +/- 0.08	-9	0.28
Length of Hospitalization	5.97 +/- 0.29	6.48 +/- 0.54	+9	0.41

Harris, Gowda et al used Byrd's hospital score to assess differences between their two groups. Where in Byrd's study changes in his scoring system reached statistical significance between the

intervention and the control groups, results of this study did not confirm Byrd's results. (Harris, Gowda et al 1999)

Matthews, Marlowe et al 2000

Matthews, Marlowe et al recruited forty participants with rheumatoid arthritis to study the effects of two different forms of intercessory prayer—distant and direct-contact prayer, also referred to as the 'laying on of hands' (Matthews, Marlowe et al 2000). Twenty-six patients were placed in group one and 14 placed in group two. Group one patients underwent an intense three-day prayer session in October 1996, with 'laying on of hands'. Group two patients were wait-listed and served as controls at the six-month evaluation point. At that time patients from group two underwent the same intensive prayer intervention and were followed up at 6 months. The investigators also randomized 13 patients from group one and six patients from group two to receive distant intercessory prayer during the first six months after the three-day prayer intervention. All patients continued their medical therapies during the entirety of the study.

In primary analysis one, all patients were analyzed as to pre-intervention variables and post-intervention variables at 12 months. The following table shows the results:

Variable	**Baseline**	**12 Month**	***P* Value**
Tender joints (no.)	16.8 +/- 7.0	5.7 +/- 6.2	<0.0001
Swollen joints (no.)	9.8 +/- 5.4	3.1 +/- 4.6	<0.0001
Grip strength (mm Hg)	244.3 +/- 117.1	278.8 +/- 136.6	0.039
ESR (mm/hr)	40.9 +/- 31.6	42.1 +/- 24.5	0.787
CRP (mg/dL)	1.5 +/- 2.0	1.4 +/- 1.9	0.744
Global rating	4.5 +/- 2.7	3.1 +/- 2.7	0.004
Pain rating	7.4 +/- 2.4	7.9 +/- 2.5	0.134
Fatigue rating	4.5 +/- 3.4	3.1 +/- 3.0	0.007
Arthritis Impact Measurement	121.2 +/- 24.9	107.7 +/- 29.4	0.0002
Modified Health Assessment	36.2 +/- 7.8	32.9 +/- 8.2	0.012

There was a statistically significant difference pre- and post-intervention in the number of tender joints, swollen joints, grip strength, global rating, fatigue rating, AIMS evaluation and MHA questionnaire. Likewise on multivariate analysis, there was a statistically significant improvement from baseline to 12-month follow-up ($P < 0.0001$).

In primary analysis two, the investigators compared group one vs. group two, baseline vs. six-month data. The improvement seen in group-1, which received the intervention during the first six months of the study, when compared with the changes in group two, which had no intervention in the first six months, showed a statistically significant difference ($P < 0.0001$) on multivariate analysis. There was no statistical difference in the group receiving distant prayer vs. the group not receiving distant prayer on both multivariate and univariate analysis. (Matthews, Marlowe et al 2000)

Systematic Reviews

Two recent systematic reviews on prayer have been done. The systematic review done by Astin et al used the following admission criteria:

1) Random assignment of study participants
2) Placebo, sham, or otherwise "patient-blindable"
3) Publication in peer-reviewed journals
4) Clinical (rather than experimental) investigations
5) Study of humans with any medical condition (Astin et al 2000).

The initial intention of Astin et al was to do a meta-analysis. However, due to heterogeneity among the studies, this could not be done. Of the more than 100 clinical trials on 'distance healing,' only 23 met admission criteria: five studies used prayer as the mode of distant healing, 11 used non-contact Therapeutic Touch, and seven used other forms of distant healing. Of the five prayer studies, two found a significant treatment effect (the studies by Byrd and Harris, Gowda et al) and these two had the largest number of patients enrolled. One (Collipp 1969) found a higher death rate in the control group that did not reach statistical significance, and two other studies showed no treatment effect. Of the 23 studies that met the admission criteria, 13 studies yielded statistically significant treatment benefit, nine showed no effect over control groups, and one showed a negative effect.

Roberts et al published another systematic review on intercessory prayer as the intervention. They found four studies that met their admission criteria. These included Joyce and Welldon, Collipp, Byrd, and Harris, Gowda et al. The data from three studies (Joyce and Welldon 1964; Byrd 1988; Harris, Gowda et al 1999) show that prayer was associated with a reduced likelihood of an intermediate or poor outcome. In the Byrd study and the Harris, Gowda et al study, intercessors specifically prayed for no complications. Roberts et al point out that these two studies "presented such a series of problems that could be construed as 'complications' that statistical analysis was bound to highlight some as 'statistically significantly' improved by prayer." To overcome this limitation Roberts et al asked a blinded expert to choose a single generic complication. The expert chose readmission to the CCU as a complication that could be easily ascertained. Intention-to-treat meta-analysis suggests that prayer increases the odds of readmission to the CCU. However, the intention to treat analysis stands on shaky statistical ground. Changing either statistical analyses or assumptions results in loss of statistical significance. Roberts et al also point out that the focus of prayer in the Byrd and Harris, Gowda et al studies, was to ask for speedy recovery. Examining the number of days hospitalized shows no differences between treatment groups when compared with controls. Both of these systematic reviews concluded that enough pilot data exist that suggest positive therapeutic effects that further blinded, controlled studies are warranted.

Finally, there are three large ongoing studies. Herbert Benson at Harvard began a randomized controlled trial assessing Judeo-Christian prayer using 1800 patients awaiting heart surgery. (Roberts and Ahmed 2001) Another by Choi was also begun in 1997 looking at the effects of distant prayer on multiple sclerosis (Roberts and Ahmed 2001). Also, Krucoff at Duke is carrying out a large clinical trial. (Personal communication) To my knowledge these studies have not yet been published.

Critical questions of and reflections on the evidence

It is clear from what precedes that the results of empirical studies on prayer are equivocal at best. Several problems have been noticed and acknowledged by clinical researchers.

Ethical Questions

These prayer studies raise a few ethical questions. If people of faith believe that prayer is helpful and certainly not harmful, why would they restrict prayer to the intervention group? Another question is directed specifically to the Joyce and Welldon and Harris, Godwa et al studies. Is it right to put people into a study to which they have not consented in order to reduce bias? It is possible that some people would have not wanted to participate in a study as some did not in the Byrd study. Byrd states that 57 patients "refused for personal reasons, religious convictions and/or unwillingness to sign the informed consent' (Byrd 1988). That means that 12.6 % of patients eligible to participate in Byrd's study refused to do so. Applying the same statistic to Harris, Gowda et al would mean that approximately 125 patients would not have participated, which seems hardly trivial.

Methodological Questions

First, controlling for prayer in the non-prayer group is impossible. Prayer is pervasive when people are faced with illness. Even acknowledged atheists will pray in significant trial. Thus, one can never know that the control group is without prayer. The proponents of studying prayer will presumably counter by saying that by increasing the numbers in each group one can control for crossover. Depending on the prevalence of prayer, one will need higher numbers to control for people being prayed for in the non-prayer group. In addition, assuming that someone is being prayed for in the control group, one can assume that prayer is additive and that the intervention group will be getting a net higher dose of prayer than the non-intervention group (Harris, Gowda et al 1999). Of course, this assumes that prayer is additive, and I am not sure how to sum prayer.

When applying prayer as a treatment to be evaluated, several key questions must be answered. Thompson points out that we must first understand something of the quantitative and qualitative nature of prayer (Thompson 1997). Can a dose of prayer be measured? What does the investigator measure when measuring a dose? How many prayers does the subject need in order to see an effect? Are one person's prayers as good as another's? (Thompson 1997) Assuming that prayers are additive, how many intercessors would one need in order to see a measurable effect?

Statistical Questions

Willem Van der Does points out an important point particular to Harris, Gowda et al. By making "34 comparisons using separate t tests with α set at 0.005 and another 3 with α set at 0.05, the chance of finding one significant difference is not one out of 25, but:

$$1 - (1 - 0.05)3 + 1 - (1- 0.005)34 = 0.14 + 0.16 = 0.30$$

almost 1 out of 3." (Van der Does 2000) That means that in order to reach a statistically significant difference, a value of $p < 0.001$ (0.05/37) would need to be achieved. Thus, the

likelihood of a chance event is significantly higher than is claimed by Harris, Gowda et al; no statistically significant difference was attained in their study.

Donald A. Sandweiss makes a very astute observation (Sandweiss 2000). Drawing on the work of Goodman, he states that efficacy trials should not rely so heavily on *P* values, particularly when the *P* value is at the 0.04 level as in Harris, Gowda et al. One must also take into consideration the pre-test probability of the explanation in addition to the findings. (Goodman 1999) Sandweiss claims that if one's physics does not allow for telekinesis, distance healing, or intercessory prayer, then a very definitive *P* value will be necessary to overthrow the current explanatory paradigm. Sandweiss may be overstating the case a bit. In the day-in-day-out practice of science, the questions posed are not paradigm changing. Certainly when calculating the pre-test probability, auxiliary hypotheses are at work. In all of the prayer studies an explanatory mechanism is missing, which renders the pre-test hypothesis very unlikely on any scientific world-view. However, in their defense, clinical researchers are not seeking to overthrow paradigms, but to answer questions. The single question is, does prayer as an intervention result in some predetermined statistically significant difference between prayer and non-prayer groups—if *P* is less than the calculated α the answer is yes; if *P* is greater than α, the answer is no. However, Sandweiss' point remains important. For the most part, the community of scientists do not accept the mechanisms proposed for how prayer and distance healing work. That would require a significant shift the investigators' models and theories, if not their paradigms.

Larry Dossey and others counter that science, with its materialist world-view dismisses these studies too handily. (Dossey 1999; Dossey 2000) They point out that James Lind had no explanatory mechanism, but still we accept that limes prevent scurvy. Why should prayer studies be held to a higher standard when looking for correlations without causal mechanistic explanations? This point is well taken. However, Sandweiss remains correct in his assertion. Pre-test probability on the efficacy of an intervention will determine the weightiness of the data needed for the community of scientists to accept the proposed mechanism.

More importantly, pre-test probabilities are a function of the current explanatory models in science. In every experiment carried out by science, there are auxiliary hypotheses that are assumed to be true. One must accept on blind faith these hypotheses to be true in order to carry out the experiment and to make interpretations. It, in fact, does matter that one buys into a materialist and mechanistic world-view when carrying out experiments on prayer. Predictions and hypotheses are both made using explanatory models and theories. Thus, when proposing hypotheses, the experimenter is in fact relying on previous studies, previous evidence, and theories to make her predictions. These auxiliary hypotheses allow her to generate a hypothesis and also to calculate a thumb-nail estimate of pre-test probability. Based on the widely accepted explanatory model of normal science, the weight of evidence would indeed need to be large in order the community of scientists to accept a $P < 0.04$. Clinical investigators will counter that they only need to reach a $P < \alpha$ for them to claim that something works or not. They are making no claims about mechanism. Their claim is only partly true, however; they do rely on the "how" of the world when claiming that their statistical models are capturing a snap shot of the world, if not also relying on models and theories of the world when posing their questions.

I am sure that Dossey, and other like-minded thinkers, will claim that the current explanatory models, which I am willing to admit are socially constructed, are inadequate. That may in fact be true. But in order for an accepted explanatory model to be proven inadequate, the community of scientists will have to have evidence that reaches what science claims to be scientifically feasible. The whole point of science is that the community of scientists, as a group, decides what is acceptable. No single, isolated or narrow version of the world has privileged status and it has been the tradition of science that this widely-accepted version of the world is more likely to be adequate to the world. I concur with a modification of Sandweiss' point. Even if pre-test probabilities do not enter into the clinical researcher's calculations, the evidence that prayer works will indeed have to be substantial, because it does require the abandoning of prevalent materialist world-views.

The current studies reviewed in these Grand Rounds have not yet risen to that challenge. I say this as one who has religious faith, prays, believes in prayer, and as one who believes that God hears prayer and that God has an on-going relationship with the world. There is another, even greater difficulty that the researchers to date and all researchers in this area in the future will face—the crossover between what are two different and mutually exclusive epistemologies. I shall return to this point later.

What counts as efficacy?

Clinical trials attempt to pick objective endpoints to evaluate the effects of an intervention. A subjectively defined endpoint may result in the trial not showing an effect that is still present, a beta error. In their attempts to ascertain efficacy, researchers will attempt to use validated and reliable instruments, endpoints like death or days in the ICU, or something measurable like blood pressure or heart rate. Thus, clinical trials use a very coarse comb to brush through the data set in hopes of catching something measurable or observable.

The question then arises, does an endpoint that counts as efficacy in a clinical trial represent what people of faith mean by prayer 'works'? What counts as 'it works'? 'It works' in the realm of spiritual traditions may have no correlation with 'it works' in the realm of scientific traditions. People of faith may implicitly mean something completely different than what science means by 'it works'. Which version of efficacy is to be assessed? Do religious traditions and their belief systems have to live up to the rigors of science? Perhaps the rigors of science are not fine enough to assess what religious and spiritual traditions mean by 'prayer works'. Which version of 'it works' is to be assessed? And even if there could be a mutually acceptable version of efficacy, there is no guarantee that the methodological tools of clinical research would be able to capture that version of efficacy.

Practically speaking, several questions arise. What are clinicians to do with this information? If prayer proves effective as defined by clinical medicine, will we recommend to our patients that they should pray? It seems ludicrous for a physician to give a prescription of prayer to a person who may have no context within which to pray. Will agnostics and atheists pray at the suggestion of their doctors? To whom shall they pray? Will prayer 'work' in someone who has no belief system capable of sustaining prayer? Will it be detrimental to the atheist patient by causing some sort of cognitive dissonance in his life?

Or, what if it is proved that prayer does not 'work' as defined by science? Will clinicians not support the prayer of religious people? Will clinicians then claim that prayer is a silly superstition—a claim that science has often hurled at religious faith? Will medical science then remain silent and merely tolerate religious faith? Will clinicians patronizingly say, "go ahead and pray; it can't hurt?" Moreover, what if these studies cause crises in faith at the end of ones life? Would it be medically prudent for a patient to find out that his prayers do not work? What psychological effect will this have on the patient's condition?*

Or, what if prayer proves harmful as defined by science? Will clinicians then discourage their patients from prayer? Will researchers say religion is bad for your health—health as defined by clinical researchers? It is possible that people will choose a meaningful death over a relatively meaningless life. We frequently see patients who choose to go home and die surrounded by friends, family, priest or rabbi, even when there is a chance that a medical intervention might work. People frequently choose unproven alternative therapies over medical therapies. They may do so because the Complementary and Alternative Medicine (CAM) practitioners are charlatans giving out false information that confuses patients. To the contrary, I would argue that people often choose CAM because the CAM practitioners offer meaningful interactions with their patients—something that conventional, scientific medicine has failed miserably at doing. (Sobel 1999; Campion 1993; Kaptchuk and Eisenberg 1998; Davidoff 1998) 'It works' may need to be redefined by medical science. I shall return to this point later.

Philosophical Questions

There are a few philosophical and theological problems as well. Could a good God possibly be swayed to help one group of people over another on the triviality into which group a few scientific investigators placed them? It seems odd to think that a Being that is purportedly omnipotent and all-good would let Itself be limited by a few scientists. In other words, can God be randomized and controlled in a study? The answer from all three theistic religions will of course be a resounding NO!

What does it mean to show on univariate analysis, as Byrd did, that prayer reduced the patient's chances of cardiopulmonary arrest or the patient's need for antibiotics, but did not affect the number of episodes of ventricular tachycardia or sepsis? Are we to say that prayer works for preventing pneumonia ($p < 0.03$), but not sepsis (non-significant p)? Or, are we willing to accept the *P* values of Harris et al that prayer prevents the need of Swan-Ganz catheterization, but not intubation? It seems odd that God should be concerned about placing Swan-Ganz catheters in patients but not about intubation. Both Byrd and Harris, Gowda et al would probably counter that they were looking for general effects. However, the religious traditions of Judaism and Christianity—and Islam for that matter—assert that the God, to whom prayers are directed as in these two studies, is a God of particular providence and not just general providence. That means that God affects the particular events in the lives of individual people, and not just general events discernable only at the level of population statistics.

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* I am indebted to the Rev'd Michael S. Mills for this point in personal discussions over a beer at the Flying Saucer.

Mechanisms for the efficacy of prayer

There is a notable lack of proposed mechanisms for the efficacy of prayer. Some investigators have claimed that prayer is a form of distant healing. The initial clinical investigators used the world-view of theistic religions—the religions that believe that the Creator-God brought creation about through Its power and sustains that creation even today. These religions, of course, hold that prayers may be offered for purposes of worship, meditation or contemplation, and supplication or intercession. This final type of prayer holds that God is a personal God; that is, God has a personality and can be prevailed upon and does intervene in the world on behalf of those who call upon Him in prayer. The prayer studies listed above all assume this world-view. Clearly, prayer does not fit into the scientific world-view. Prior to this decade, scholars believed that the benefits of prayer were at best psychological. (Brown 1966; Gilbert et al 2000)

Various other explanations are floating around. Keith S. Thompson, a distinguished biologist, holds that there are two possible explanations for the efficacy of prayer: 1) through the mind or through the *state of mind* of the person for whom prayers are offered or 2) through divine intervention. (Thompson 1997) Thompson thinks the former is the case for most instances where through scientific methods one can determine an effect. Prayer, on this account, would thus be efficacious in ways that many other psychological states affect health. It works because the person for whom prayers are offered believes that it works. On the other hand, if there were a divine mechanism for prayer, it would appear that the divine being is being controlled or is being prevailed upon to intervene. To assume that prayer can effect the actions of a divine being in a consistent and reliable—and therefore testable—way is arrogance at best and blasphemous at worst, according to Thompson.

Dossey refers to the psychological explanations as mind-body medicine, or Era II medicine. Dossey refers to the eras of medicine in three categories. Era I medicine refers to the materialistic and mechanistic form of medicine. Era I is stuck in the physical world. It is deterministic and described in terms of classical, Newtonian physics. (Dossey 1999) Therapies in Era I medicine are the traditional medical interventions—drugs, surgery, radiation, etc. Era II medicine is mind-body medicine. This era of medicine is marked by the interaction of mind and body. On this version of medicine, therapy, such as psychoanalysis, still is grounded locally—that is to say, the mind affects only the body to which it is attached[†]. Psychoneuroimmunology, hypnosis, biofeedback, and realization therapies are all forms of interventions in Era II medicine. In Era II, consciousness can affect one's own bodily processes, but not the processes of others or processes of things that are not local. Era III medicine, the type of medicine for which Dossey is a major proponent, is a form of non-local medicine. He also refers to it as Eternity medicine. "Mind is a factor in healing both within and between persons." (Dossey 1999) Mind is not localized to the body. It is potentially in communication with all other minds. Consciousness is eternal and would be roughly equivalent to the divine being. Healing interventions will take all the forms of distant healing, intercessory prayer, and transpersonal imagery. For Dossey, intercessory prayer is part of non-local healing through the agency of consciousness.

Despite his claims of immateriality, Dossey's Era III or Eternity Medicine remains a part of this universe, which is an entirely different claim from that of the theistic religions. Jeffrey S. Levin

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[†] This description is perhaps not entirely fair and perhaps caricatures Dossey's Era II medicine as to dependent on a dualist view of mind-body.

offers a theoretical model for mechanisms of the efficacy of prayer. Levin offers the following diagram:

	Local	Non-Local
Natural	A	B
Super-Natural	D	C

On his explanation, Levin states that most of the time we think of healing in naturalistic local terms: give a medication and see an effect. The explanatory model offered by Dossey, and most of the New Age healers, falls into B. That is to say that the natural order is at work, even if nature as defined by normal science turns out to be very different from what is presently accepted by the community of scientists. "Until medicine can acknowledge and account for truer conceptions of the natural universe, [Dossey] contends, it does not deserve to be called scientific." (Levin 1996) On Dossey's account, consciousness, while non-material, is still part of the natural world. Dossey's explanations are really something quite different from what the theistic religious traditions mean by prayer. Consciousness and non-local mind, and even God as the term is sometimes used by Dossey, are all terms for what has not yet been discovered by science. The types of healing that occur under Dossey's explanatory model, according to Levin:

> may violate the tenets of prevailing biomedical conceptions of physical law, but this is more a result of general misconceptions within contemporary biomedicine than any sort of transcendence of physics. Rather, the 'real' physics of the universe is considerably more unusual than most people imagine, but once grasped, offers an elegant, logical, and convincing explanation for the results of certain studies. (Levin 1996, 69)

Thus, Dossey insists that medicine should abandon its old physics—and even its metaphysics—for the physics of mind, which happen to correspond with quantum physics. Dossey is a proponent of studying the non-local affects of intentionality and mind upon the animate and inanimate universe. He reports numerous studies of the effects of the mind or mood states on computers, robots, animals, plants, bacteria, fungus, red blood cells. (Dossey 1999, 37-84; Watkins 1971; Barry 1969; Grad 1965; Grad, Cadoret et al 1961; Braud 1990; Haraldsson and Thorsteinsson 1973; Sheldrake and Smart 1997; Dunne and Jahn 1992; Radin et al 1996; O'Laoire, 1997) Dossey also proposes that more studies on the effects of mind or consciousness should be carried out on bacteria, yeast, plants and animals instead of proceeding with further

clinical studies on humans. He believes that the effects of mind can be either good or bad; therefore non-human studies should be carried out first.

According to Levin, neither of these models actually claim what the traditional proponents of prayer claim in the theistic religions. I am in agreement with Levin's assessment of the theistic faith traditions. In the philosophy of the theistic religions, God is not only immaterial, but is wholly other than the things of the universe. God cannot be reduced to the material world, energy, consciousness, or non-local mind. The God of the theistic religions is a God that creates the world *ex-nihilo*—literally out of nothing. God is the something that exists even prior to the primordial nothingness out of which God creates the world.[‡] These theistic explanations are radically different than the new physics of medicine offered by Dossey, or even quantum physics for that matter. John Polkinghorne, a theoretical physicist and Anglican priest holds that contemporary quantum physics is in congruence with traditional theisitic faiths. (Polkinghorne 1999) The theistic traditions assert that God is supernatural; that is to say, above and beyond nature. God cannot, by definition, be captured in the formulaic explanations of scientific enquiry. It is to this God that prayer is directed. The interventions requested, like the God to whom those petitions are made, will not be detectable at the level of mechanism. Examples might be, the cancer was there and then it is not; or the patient was ill, but now is not; or, the patient should have died, but did not. All of these phenomena will be observed as phenomena, but they will remain inexplicable under all of the naturalistic explanatory models, whether those models be of normal physics or those of the, as yet, unexplained paranormal physics. Like the God who brings about the phenomena, the mechanisms will remain unknowable. To put it into Aristotelian, Maimonidean and Thomistic metaphysics, God as the first cause cannot be captured by any science. Human inquiry is only at the level of the secondary cause. (Moses Maimonides 1190; Thomas Aquinas 1264)

Epistemology and the discourse between religion and science

Up to this point, I have only been discussing physics and metaphysics. Now I would like to turn to epistemology. Epistemology is the field within philosophy that examines theories of knowledge. What counts as knowledge in the world of science is very different from what counts as knowledge in the world of religious faith. Scientific ways of knowing are really quite unique. Do we count empirical knowledge higher than reason or vice-versa? Science is a unique tension between reason and empiricism. Reason tells us we should doubt our senses and that we should seek rational or mathematic explanations. Sensory experience would have the moon appear to be one inch across, but reason, geometry and mathematics would tell us the contrary. Science then is systematic doubt applied to the sense experience of the world. On the other hand, the human mind is given to flights of fancy and metaphysical speculation—starting from the wrong premises, we can reason consistently and correctly while the reasoning itself may have nothing to do with the world. Thus, one must ground one's explanations for the phenomena of the world in what is observable. Yet we observe with our senses and as pointed out the senses cannot be trusted. The methodology of science comes about as a highly complex form of rational and skeptical empiricism. Scientists take empirical experiences of the world, apply doubt using reason and mathematics, then turn around and try to take the mathematical

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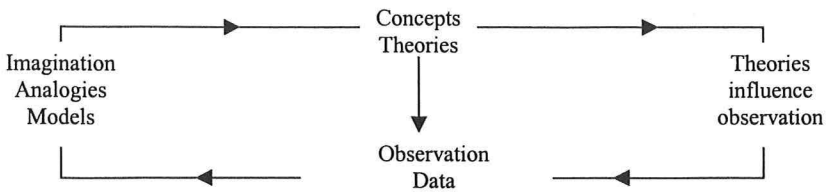
[‡] See Levin for an excellent explanation of Jewish Kaballah on this issue.

explanations of the world back to the world to see if they stack up to what is empirically observed.

Further, science does not assess the world in a raw, unmediated way. Ernst Cassierer states that science is the one discipline that interposes many layers between the human experience of the world and the world itself. On the scientific version of truth, truth is not to be attained if human knowledge is limited to immediate experience. That is to say, experience is mediated by previous experience. We appropriate the world in terms of language and culture, which were gained through sense experience of language learned in community. Just as the world is mediated to us through language and culture, science is another way that the world is mediated to us. With science we do not get a detached view of the world, but rather a comprehensive and interconnected view. The world is linked together through paradigms, theories, models and hypotheses. (Cassierer 1944, 208). Moreover, in science, that world is symbolized in numbers, mathematical theory, and statistics. These rational constructs are symbols that stand in place of the world that we observe. These symbolic representations are interposed between the researcher and the world. In fact in Bohr's model of the atom, there is no longer the picturesque planetary vision of the nucleus with orbiting electrons. In quantum physics, "the pure symbolism of number supersedes and obliterates the symbolism of common speech." (Cassierer 1944, 214-5)

This scientific methodology has proven invaluable for the advances in science and technology. Yet, science is not the end-all of knowledge. The philosophical positions of the logical positivists hold that the only meaningful statements are empirical statements made by science because these statements are empirically accessible and knowable as true or false. Metaphysics, ethics, religion, art, literature, and culture are merely preferences that are neither true nor false. In fact, existential questions are ruled out as possibly answerable. The world, on this philosophical position, is a meaningless place for human living. Science, and scientific methodology answer 'how' questions and ontological questions; that is to say, science answers questions of processes of the world—what is the case in the world. It does not, nor can it, answer any questions other than 'how'. How did the diversity of life develop on planet earth? How did the universe come to be this way? How does the heart work? Science, as a methodology, can also answer certain adjunct questions related to process. Is such-and-such the case in the world? Does this intervention result in death? These latter questions are dependent on certain theories and auxiliary hypotheses that make these latter questions possible. "Does prayer work" is studied based on other prevalent theories of how the world works. Control and randomization measures, statistical analyses, and mathematical models are all dependent on the prevalent theories of how the world operates and on how knowledge of the world is attained. Thus, the prayer studies cannot get past being 'how' questions. In short, science asks very narrow questions delimited by its methodology and restricted to natural phenomena. Science is about processes. It is a methodological approach to the world.

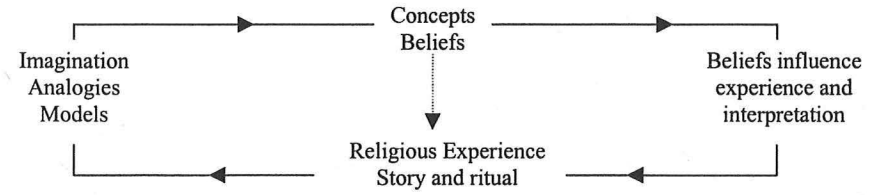
The two basic components of science are theory and data. Data and theory do not exist as separate components but are interrelated. Ian Barbour offers a schema to understand the structure of science.



The Structure of Science
Religion in an Age of Science

The left hand loop, the context of discovery, requires that observational data be placed into imaginative models or analogies. These will then go to help create theories. The downward arrow represents the context of justification. We say that our theories are justified if they hold up to the observations. Of course if the theory is not justified by the observation, we do not abandon the theory. Many times minor changes and *ad hoc* auxiliary hypotheses are created to salvage the theory. Theories are never tested in isolation, but are dependent on a network of theories. If the theory does not hold up at one point, there may be other theories that explain the discordant data. The right hand loop shows that all data are theory-laden. Choosing which phenomena we look at is dependent on the theories we hold. In addition, the form of the questions asked will affect the kinds of answers we receive. Moreover, theories are at work in our assumptions about how our instruments work and the ways we talk about data. Finally, the process of observation itself may alter the observed objects or processes. (Barbour 1990, 31-34)

Religion, like science, has two basic sources of knowledge as well—belief and experience. Barbour sees structures of religious knowledge that are similar to that of scientific knowledge.



The Structure of Religion
Religion in an Age of Science

The data, so to speak, of religions is the community story and ritual, the religious experience. Religious concepts and beliefs arise through the imaginative creation of analogies and models to explain the religious beliefs or concepts. Barbour places a dashed line between religious beliefs and concepts, because testing and judging the religious beliefs against the religious experience is difficult, though criteria can exist. There are of course no uninterpreted experiences, just as there are no theory-free data. (Barbour 1990, 36-37) Beliefs come about through communities of people with like experiences. The world is appropriated through shared stories about the world. Through these stories, people have a way in which they share experiences—experiences, which may be common to the local communal group, if not to all humans.

These experiences usually arise in crisis or existential moments—moments when one's world-view is challenged or when one is threatened. Drawing on the work of Frederick J. Streng, Barbour delineates these experiences. 1) The numinous experience occurs when one realizes that one is a small part of a very large world, when one feels a certain dependence, finitude, limitation and contingency. For theisitic traditions, there is a perceived smallness when standing in the presence of the Eternal. 2) The mystical experience comes when one has the sense of being at one with the larger whole of the universe or at one with the Supreme Being. 3) There are transformative experiences of re-orientation, when one finds oneself feeling estrangement or brokenness and in need of reconciliation and wholeness. 4) People also experience courage in the face of suffering or death or transiency. Meaninglessness is overcome when one places oneself in the context of something larger like a community story or ritual. 5) There are moral experiences of obligation. Many people have chosen death because their moral obligations require this of them, rather than compromise. This moral experience can be seen in the prophetic works of Hebrew, Christian, and Islamic scripture, where the prophets are killed or socially cast out as they preach in favor of the poor, the widow or the orphan. 6) Finally people have responded to the experience of the order and creativity in the world with a sense of gratitude and reverence. Religious experience then gives meaning to the world. It answers existential 'why' questions and not worldly 'how' questions. Religion cannot answer 'how' the carbon molecule behaves in the way that it does. Science cannot answer why there is a universe at all. Why is there a universe? Theistic religions respond, because God made it. Why do we suffer? Theistic religions respond, because humankind is estranged from God and does not yet know how to behave himself. The stories told by religious traditions often address these questions giving suffering, and even death, a context for appropriating ones own experience into a meaningful and coherent whole.

In short, while science and religion may share similar structures, they are like two different languages shared by two different communities. Science is able to express things about natural phenomena, the physics of the world. Some scientific thinkers like Edward O. Wilson in *Consilience* claim that art, literature, politics, philosophy will all be subsumed under theories of evolutionary biology. (Wilson 1998) Despite this claim, these scientists must assume a material metaphysics and ontology, and they must assume the epistemology of science to be adequate to the world. Each of these assumptions cannot be proven scientifically. These are philosophical positions that cannot be proven using scientific methodology. We must not assume that science can do the jobs for which it is not designed. As Barbour points out, scientists are no better at making decisions about living after they have stepped out of their labs than the rest of us. (Barbour 1990, 14) Religions—defined broadly—on the other hand, are guides for living. They

allow people to understand the moral norms of a given community. They are the means by which people appropriate the meanings of life. These religious languages are designed for other purposes than the languages of science.

I would contend then that prayer is a response, a reaction to existential moments in a person's life. Prayer is the religious language given to express moments of existential experience. The awe and fear of these moments need not be expressed in religious language. It may also be expressed in poetry, art or cultural ceremonies. Prayer, like other expressions, is the means by which the religious person expresses himself in existential moments. One prays for purposes of worship, standing in the presence of the Almighty, realizing one's own small place in the midst of a vast universe and in the presence of the divine Other. One prays for purposes of meditation, of encountering the universe or the divine Other as a part of a unified whole. One prays when faced with crises of estrangement from the community. One prays in the face of death and suffering for healing and wholeness, for strength and comfort. One prays for strength to attend to one's moral obligations in the face of moral uncertainty. One prays with gratitude and reverence for order and divine creativity when faced with frailty. Scientists may express awe and wonder at their work, but science cannot begin to assess the responses to these existential questions—questions that are as basic as scientific questions. Prayer is a response to existential moments and crises, to 'why' questions. There are essentially two kinds of human questions—how and why. Both are equally relevant.

For Cassierer, religion and science are just two among a number of mediators of the world.[§] Each acts as a lens that focuses certain aspects of the world so that human experience of the world can be appropriated. The lens of religion allows us to see certain things about the world, things that science cannot see. Likewise, the lens of science allows us to see certain other things about the world, things that religion cannot see. Many times the religious explanation will be at odds with and contradictory to the scientific and vice-versa. (Grinnell 1986) Certain kinds of questions—'why' questions, existential questions—will be better answered by religious epistemologies. Other types of questions—'how' questions, process questions—will be better answered by scientific epistemologies. Religion cannot answer process or 'how' questions; science cannot answer existential or 'why' questions. (Gould 1999) Each has its realm of knowledge; each deserves the respect of the other. To rule out the possibility of existential questions because your dominant epistemology, namely science, cannot answer them seems odd. Simply to assert that 'why' questions are out of order does not stop human beings from asking the question. (Aiken 1952) Moreover, I would argue that 'why' is a more fundamental question and a far more interesting one than 'how'. 'Why' questions cannot be avoided even by scientific materialists. It seems absurd for science to rule out fifty percent of the questions.

Science and Religion

Ian Barbour offers a schema for understanding the interaction of science and religion. Religion and science can be in conflict with one another, independent of one another as realms of knowledge, in dialogue with one another, or integrated with one another. I shall briefly describe each of these.

[§] Cassierer delineates six different mediators: myth, religion, language, art, history and science.

Conflict

While the popular vision of the interaction of religion and science is that of conflict, this has been less the case than is commonly held. Galileo and Newton never lost their faith. There is much scholarship to show that Galileo was inhibited more because of his bravado than for what he actually taught. (Gould 1999) Darwin, while he lost his faith toward the end of his life after his daughter died, did not lose his respect for people of faith. And people of faith did not abandon Darwin. He was, after all, buried in Westminster Abbey at the request of a clergyman of the Church of England. You can visit him at the Abbey to this day.

However, there are particular versions of religion that reject science and there are particular versions of science that reject religion. For each group, you must either choose science or religion. Those religious positions that adhere to Biblical literalism will often find themselves at odds with science. Usually these religious traditions will not, however, abandon science. The most obvious point where this group might find itself at odds with science is evolution. The creation stories of the Bible will be taken literally by these people. However, most of these adherents do not totally abandon science or its advantages, particularly in the realm of medicine. The most prominent group that rejects medical science would be the Christian Scientists. This group is not so much against medicine as it is in favor of science taking a more serious look at the role of faith and prayer in health and healing. (Eddy 1875) On the scientific side, there are the materialists like Edward O. Wilson. (Wilson 1998) The proponents of scientific materialism hold that ultimately all will be encompassed by scientific theory. Religion, art, music, philosophy will ultimately be reduced to evolutionary biology. On this position, religion served its purpose while human societies progressed along. Now that science has arrived, there is no longer any need for the arts, philosophy, and religion. All other disciplines will be subsumed under the field of science.

Independence

On both the scientific side and religious side, there are proponents of independence. Scientists, like Stephen Jay Gould, argue for an independence model of the discourse between science and religion. Gould argues for what he calls non-overlapping magisteria (NOMA). The word magisterium comes from the Latin (*magister*, teacher). A magisterium is a field within which one has authority in teaching. Gould, an agnostic, argues that science has authority to teach in the realm the physical world and that all things natural are open to scientific evaluation. Gould also claims that numerous fields of inquiry stand outside the realm of scientific exploration. Philosophy, literature, and religion each have been pondering the meaning of life and the ethical standards for life for a very long time. Yet knowing what 'is', the realm of science, will not tell you what 'ought' to be. Religion is a separate field that can teach in this area. (Gould 1999)

On the religious side of the independence model is that of Christian neo-orthodoxy, a protestant movement in the early part of the 20th century linked to the theology of Karl Barth. On this version, revelation stands outside of reason. It has nothing to do with reason. The neo-orthodox position claims that science is dependent on reason and observation as its means of knowing the world, where religion is dependent on revelation as its means of knowing. Thus, the two do not overlap. Science cannot make claims about ultimate existence and meaning and religion cannot make claims about the processes of the world. (Barbour 1990)

I have already presented a philosophical version of independence in the epistemology section above. As realms of knowledge, as realms of gathering knowledge, I argue that the two are separate, both on the kinds of questions answered and the methods by which each proceeds in examining the world. I am only willing to make this claim up to the level of inquiry. That is to say, as fields of human inquiry, science, when it remains at the normal level, and religion must remain independent. However, in any one person's life, they cannot be separated.

Dialogue

Another way that science and religion relate is in dialogue. On the scientific side of this claim there are similar methodological parallels. Thomas Kuhn has shown the importance of the scientific community and scientific tradition to the activities of scientists. (Kuhn 1970) Clearly community and tradition are central to religious traditions. Barbour has delineated how the two realms, while methodologically dissimilar share some of the same elements. I have briefly discussed Barbour above. In short, he claims a similarity in methodology though the objects of interest are distinct and the sources of community knowledge are different.

According to Barbour, thinkers like Karl Rahner and David Tracy fall into the dialogue camp on the theological side. Rahner argues for what he calls the horizon, the background that is always present though it may never reach the level of explicit discourse when knowing or inquiring into a particular area, whether scientific or religious. Thus, this eidetic horizon is present in the background of both realms of knowledge. (Rahner 1997) Tracy speaks of the religious dimension of science. The kinds of questions that arise from the investigations of science at the limits of human experience are not different than those that arise in everyday life. In everyday life, these limit situations arise in the experiences of anxiety or death, as well as joy and basic trust. Because science is a human endeavor, certain limit questions will arise. Two types of limit questions in science are ethical questions in scientific pursuits and the presumptions and conditions that make scientific knowledge possible at all. (Barbour 1990)

Medicine sits at a critical juncture between beliefs and science—that juncture is the patient that sits before us. The physician's knowledge is almost exclusively that of the community of physicians, informed by the inquiry of science. Applying scientific medicine to the patient's existential or limit questions will not help. When a patient asks, "Why do I have cancer," she is not asking, "How did I get cancer". She is asking, "Why". Perhaps patients seek therapies that have not stood up to the test of science precisely because science has too sharply separated the 'how' and the 'why' of their diseases, illnesses, sufferings and deaths. Has medicine, by legitimately wedding itself to science, illegitimately and arrogantly rendered existential and religious questions as meaningless? By focusing on the processes of suffering or death, has medicine rendered the living and dying of a particular patient meaningless? Perhaps this is the source of the present dissatisfaction with medicine and the search for alternatives to conventional medicine. (Sobel 1999; Campion 1993; Kaptchuk and Eisenberg 1998; Davidoff 1998) Perhaps CAM practitioners are more fruitfully engaging the latter of these questions.

Integration

Barbour develops this form of the religion-science relationship last. Integration takes three forms according to Barbour. Natural theology is one form of integration that begins with science and works its way back to the possibility of God and what these scientific findings have to say

about the nature of God. On the other hand, a theology of nature begins with the religious experience and historical revelation in scripture and then moves to the data of science. This form of integration asks, what affect do these scientific theories and observations have on the religious beliefs and experiences? Finally, at the integration level certain syntheses are possible drawing from science, theology and philosophy. But perhaps the patient with religious faith who is in a crisis moment also operates at the level of integration. Trying to place the processes that are killing you into one's theological framework of meaning requires a remarkable synthesis.

Clearly the type of relationship that religion and science will have depends on what one counts as important. Perhaps each of Barbour's types of relationship is at work at different levels. I would argue that conflict is a very simplistic and naïve version of how science and religion should relate to one another, with each side protecting its own world-view without critically listening to all questions. However, each of the other relationships delineated by Barbour has a role in that relationship. At the level of doing normal science, scientific methodology must keep itself separated from religious epistemology. Religion has little to offer as science examines the processes of the world. On the other hand, religion, as one way of making the world meaningful and valuing it, can ask questions of science with regard to whether some aspect of the world ought to be examined. Religion will bring things to the table that science, by definition, cannot. As Gould claims, each has its magisterial roles and science should listen when religions have serious questions about what science is up to. At the level of dialogue, science will reach limit questions, questions such as the ethics of what to examine. But it may also look to religious models of the world when it confronts questions that its methodologies cannot answer. Perhaps what religions have to say about prayer is important beyond mere efficacy. Clearly integration operates at a very high level of discourse, requiring serious scientific, theological and philosophical knowledge. But it also occurs at the level of a particular patient with a particular ailment who asks the 'why' questions and struggles to find the meaning of existence in the face of the disease processes that threaten her existence.

Conclusions

I have claimed that prayer is a response to existential moments. Prayer is not an intervention, a technology to control the universe. It is not merely a psychological response. It is not merely a faith response. It is not a way that unenlightened people delude themselves. It is a response to serious human questions—questions that every human has likely asked, or will likely ask when faced with serious illness. Who has not stood atop a mountain or at the ocean and felt that she was just a small insignificant piece of something much greater? Who has not felt the unity of the whole of nature? Who has not offended or hurt a loved one and longed for reconciliation? Who will not face death and suffering in this life? In fact all responses to these questions are forms of prayer. The awe and fear of the atheist is just such and expression. The prayer of faith shall save the sick, but not because it can be proven scientifically to be efficacious, not because it 'works' as defined by the scientific community. If it works in that sense, it is by the grace of God or a mystery for which no scientific evaluation is possible. If it does not work, it still serves its purpose of seeking meaning in the face of existential crises. Prayer is a way of putting estrangement and suffering and death into a context that makes life, suffering and death meaningful. Religious traditions have spanned thousands of years making the world meaningful to its adherents. Prayer is a response to crises of existence, and in this regard, it predates

medicine. Prayer, thus defined, is an authentic human response, not a technology used to manipulate the world to achieve outcomes as defined by science.

Enrst Cassierer in his book, *An Essay on Man*, makes a startling claim. He depicts the life of an aphasic person, who has lost the ability of abstract thought, that is to say, thought in terms of universal categories. Their lives are left in the concrete factual world. Cassierer continues:

> All this is highly significant, for it shows us to what degree that type of thought which Herder called reflective is dependent on symbolic thought. Without symbolism the life of man would be like that of the prisoners in the cave of Plato's famous simile. Man's life would be confined within the limits of his biological needs and his practical interest; it could find no access to the 'ideal world' which is opened to him from different sides by religion, art, philosophy, science. (Cassierer 1944, 41)

By re-assessing the role of science in the practice of medicine, we will see that science can only give us the biological, but that patients are seeking meaning to their diseases. Religious ways of knowing, religions as practiced, are the way many people appropriate meaning. Religious adherents often turn to prayer. Forget whether it works or not from the scientific perspective. That is not the issue with religious faith. Prayer is one way of appropriating the world. Prayer cannot divorce itself from the processes. Prayer, as a religious response to the world, cannot be separated from the processes of the world for any particular patient. As realms of knowledge—often limited to experts in ivory towers—religion and science must remain distinct and independent. That does not mean that science does not raise ethical issues or that religion does not need science to carry out its moral duties to the poor, the widow and the orphan. (Grinnell 1986) But in any particular patient, the questions become exceedingly blurred. The beliefs of the patient and the processes cannot be separated, as if an academic exercise. When the processes are killing you, they have meaning for you. The processes cannot be separated from the meaning. They are intricately interwoven with each other. And for those of religious faith, they cannot be separated. To do so is arrogant. Prayer as a human response, does not need the justification of science.

Perhaps what we are encountering a paradigm shift, but I would argue it is not the kind of shift for which Dossey and like-minded thinkers are arguing. The shift is not toward abandoning one paradigm that describes the physical world according to the norm espoused by the community of scientists for the paranormal physics of Dossey. Rather, the paradigm that now challenges the paradigm of medical science is the religious paradigm—a paradigm that has throughout the centuries been the means of appropriating the world in a coherent meaningful way. Perhaps science, including medical science, had to abandon these religious world-views wholly in order for it to advance to where it has to date. As a realm of knowledge, or to use Gould's terminology, as a magisterium, science had to step away from religion. The problem now facing the paradigm of medical science is how do we allow meaning back into the encounter with the patient. After all, when the processes knowable by science are killing the patient, they have meaning for the patient—and traditionally, religions have been the paradigms by which people give meaning to the world.

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