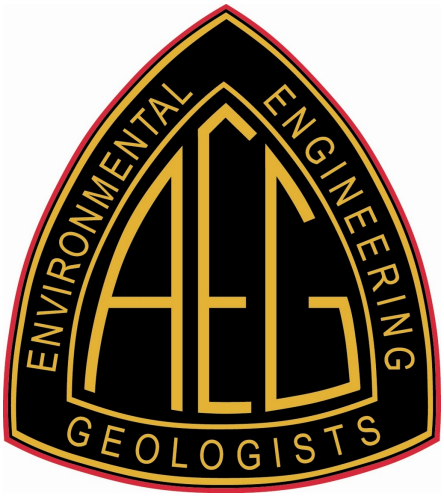
Professional Licensure for Geologists

An Exploration of Issues

Robert E. Tepel



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When emotion comes in the door, reason goes out the window.

Harlow (1992)

When emotion and intellect come into conflict emotion always wins.

Unattributed quotation in Torre and Bendixen (1988)

The reader is invited to join me in an attempt to use intellect and reason to reduce the influence of emotion, or at least recognize that we are influenced by it, in the discussion of issues in professional licensure for geologists.

R.E. Tepel

Engineering works may succeed or fail according to how well they fit their geologic environment and how well we understand the geologic processes that might affect them.

—David J. Varnes

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DEDICATION

To all the stakeholders in professional licensure for geologists, in the hope that all will benefit from this effort, even though not all will agree with me.

Preface

Introduction

As of this writing, 30 states exercise some level of control on the professional practice of geology. They are listed in Appendix 3.

The growth of ASBOG (the National Association of State Boards of Geology), and the increasing acceptance of the ASBOG licensure examination and of the Suggested Geologist's Practice Act are strong indications that professional licensure for geologists is maturing—and here to stay. That is not to say that professional licensure is fully accepted by all geologists. This book aims to frame the discussion in somewhat rational terms.

The number of states with statutory licensure of geologists, as well as "back-door" regulatory requirements, has been increasing in recent years even as public interest advocates challenged the efficacy of professional licensure. Geologic hazards are becoming more widely known. Infrastructure and other major projects are under greater public scrutiny through the environmental impact report process. The best, easiest, and most hazard-free sites are largely gone. Only the geologically troublesome sites remain. Contaminated soil and groundwater are problems in every state.

While engineering geologists have long recognized that their practice impacts the public, the public has taken little notice until recent years when such issues as groundwater contamination, rainfall-induced landslides and debris flows, sanitary landfill siting, the safety of dams, earthquake-induced landslides and liquefaction, and nuclear waste storage hit the front pages of newspapers.

The Stakeholders In Quality Geologic Practice

Adapting a project to its site and regional geologic setting protects not only the present owner-developer, but generations of the public who will use the facility or rely on its function. When we say that the purpose of professional licensure is to protect the public, the word "public" includes many stakeholders beyond the immediate consumer of the professional services. These secondary consumers have a third-party interest in the work of the professional. They, too, deserve protection from shoddy, subprofessional work. In many cases, the value of good professional work might be greater in the eyes (and wallets) of the secondary consumers than it is to the primary consumer. The stake-holders in the work of the geologist include, in addition to the geologist and the primary consumer, the following individuals.

(1) Taxpayers who fund the work of the regulatory agency that evaluates the consultant's work,
(2) Taxpayers who fund state-reimbursed clean-up costs for soil and groundwater contamination,
(3) Taxpayers who play a part in funding environmental impact reports that include geologic studies,
(4) Taxpayers who fund relief and rebuilding efforts after destructive earthquakes, landslides, and storms,
(5) Current and subsequent owners, occupants, and users of the facilities designed using the geologist's input,
(7) City, county, and state agencies and public utilities that face increased public service costs (or reduced tax revenue or sales) when an area is geologically blighted, as by a landslide, for example,
(7) Taxpayers and property owners who bear the costs related to long-term, often regional, loss of value of property due to slowly acting adverse geologic phenomena, such as land subsidence and expansive soils,

(8) Fellow design professionals, engineers, and architects, who rely on our expertise and integrity, and
(9) All who will use the facility or rely on its function.

(10) The building officials and their staffs who administer the local ordinances and codes that require the work of the geologist, and who review that work.

All these stakeholders benefit from the geologist's unique professional expertise when it is applied to the design process.

Geologists are often the bearers of bad news, but no other professional is as well qualified to tell someone "sorry, you can't build it there because there is...

- a landslide or debris flow hazard, •an active fault,
- dangerous coastal processes, or *liquefaction potential."

Or, to say "sorry, you have to modify the design because of...

- differential foundation conditions, •expansive soils,
- collapsible soils,
- weak foundation soil or rock, •high groundwater conditions, *seismic hazard,
- slope stability, or
- groundwater contamination potential."

Origins Of Professional Licensure For Geologists

Although the first state to license geologists was Arizona in 1956, professional licensure of geologists in the United States was first implemented on the basis of geologic hazards in California. The story starts in 1962, when southern California experienced a geologically disastrous year due to landslides impacting hillside development. These expensive landslides eventually led to the adoption of professional licensure for geologists by California in 1968 (see Neel, 1979; Brown, 1989; Scullin, 1992; and Slosson and Hauge, 1973). It is an interesting story, summarized below, because it demonstrates the value of state-wide licensing over local licensing, yet at the same time demonstrates the value of licensure even if it is local.

The 1962 landslides resulted in an amendment to the city of Los Angeles grading ordinance that required geologic reports for hillside development. Not a report by just any geologist, but by an engineering geologist.

Other southern California cities and counties followed suit, and soon southern California consulting geologists were plagued by a plethora of varying local rules and qualifications review committees. This led, naturally, to a call for uniform state-wide standards by means of a state licensure act. Not only would uniform licensure standards state wide help the mobility of professional geologists, but the public would benefit from increased competition among them. (Geologists don't worry about competition, they thrive on it.)

The value of strict grading codes that require geologic studies for hillside development, studies that were done by or under the supervision of qualified (locally licensed) engineering geologists and reviewed by qualified engineering geologists employed in the office of the Building Official was demonstrated only 7 years later in southern California during the storms of 1969. Alfors and others (1973) reviewed the efficacy of geologic site investigations as required in progressively more comprehensive fashion by the city of Los Angeles grading ordinances, which were improved after extensive landslide damage during years with major storms. There are basically three stages in the grading ordinance development, listed by Alfors and others (1973) as (1) pre-1952, no grading code; (2) 1952-1962, "soils engineering but very limited geologic evaluation"; (3) post-1963 the code required "soils engineering and engineering geology through all design and construction stages."

Alfors and others (1973) provide information on the value of geologic participation in grading projects based on costs of failures that occurred in Los Angeles during the 1969 storms:

> "During the early (pre-1952) stage, when no grading ordinance was in effect, approximately 10,000 hillside lots were developed. Of these, 1040 failed in 1969 for a total loss of $3,300,000 during this single storm year. The average damage was $330 per developed hillside lot and failures occurred on 10.4 percent of the lots. In the 1952-1962 period, 27,000 sites were developed. Of these, 350 were damaged in 1969 for a total loss of $2,767,000. The average damage was slightly over $100 per developed lot and the failure rate had dropped to 1.3 percent. After 1963, 11,000 sites were developed; 17 ... were damaged in 1969 for a total loss of $182,400. The average loss per developed lot was $7 and the loss rate was 0.15 percent.

These figures indicate that the loss rate can be reduced from 10.4 percent to 0.15 percent through the use of an effective grading ordinance."

There are costs associated with the grading ordinance, of course.

Alfors and others (1973) estimate the additional cost at "about 10 percent of the average losses without control."

Clearly, the Los Angeles experience with a strong grading ordinance and qualified (locally licensed) geologists submitting reports to qualified reviewers demonstrates that good geologic practice done under a strong ordinance much more than pays for itself in benefits to the public. State-wide licensure that followed implementation of the 1968 California geologists registration act provided a qualified pool of geologists throughout the state to meet the growing demand for engineering geologic services as stronger grading ordinances became more widespread.

Although hillside development is an obvious example of the value of engineering geologic studies, the value does not stop there. Many other geologic hazards, previously noted, merit the attention of geologists to the land and infrastructure development process, with similar benefits to the citizens.

About This Book

This book treats licensure issues that geologists have been discussing for decades. Readers outside the profession of geology may find that some of the licensure issues geologists think are important are, in their minds, rather quaint nonissues.

These essays sprang from my desire to understand and analyze the often emotional arguments that arose when the topic of professional registration (or licensure) for geologists was discussed. I felt that many of the discussions we geologists were having about the merits of licensure were based on unsubstantiated personal opinion, shallow and emotional analyses, and, indeed, a lack of basic knowledge of what professional licensure is, and is not.

While the use of anecdotal evidence is necessary, it should be possible once in a while, I thought, to substantiate one's views by citing research or authorities. Could we tone down our emotional responses and strive to approach (I'm not asking for perfection) the ideal of dispassionate scientific inquiry we learned in college? Certainly there were nongeologists who had given the concept of professional licensure some thought and who would be a source of information.

I compiled a bibliography (in Hoose and Tepel, 1990) on licensure topics, discovering works authored by geologists, engineers, economists, social scientists, and psychologists and many articles in the popular press, as well as letters to the editor in scientific news magazines. I learned that professional engineers, who achieved (or had thrust upon them) professional licensure nationwide over the period 1907-1947, faced the same challenges and doubts that now plague geologists.

In several chapters I cite authors who are published in the Journal of Professional Issues in Engineering Education and Practice, formerly known as the Journal of Professional Issues in

Engineering. Geologists familiar with this journal have remarked that many of its papers are as applicable to engineering geology practice as to civil engineering practice, to the point that they read perfectly well if one were to substitute "geologist" for "engineer" in them. The Journal is published by the American Society of Civil Engineers and is recommended to all geologists with an interest in professional practice and education issues.

Professional licensure is a political issue and therefore is an inherently emotional topic. I can hardly claim to have cleansed myself of all emotional response. In all sincerity, there is no intention in this book to poke fun at, insult, denigrate, or assign nefarious motives to any person or any organization. I also realize some of my evidence is anecdotal and that there are exceptions to many of my assertions, opinions, conclusions, and generalizations. The exceptions are not fatal flaws. They can be mitigated with good faith by all parties. Neither have I attempted to touch upon all possible issues. The major issues that geologists have debated in the last 30 years are examined. The remainder, while not trivial, is resolvable. The chapters are broadly grouped by general topics. Because each chapter was originally written as a self-contained essay, there is some overlap of ideas among them.

References cited are listed at the back of the book in a references section. Many of the references are from the popular press, newsletters and news magazines, letters to the editor, and other sources that are not peer reviewed. While these casual references introduce the reader to a variety of thinkers, they are written with varying degrees of bias or advocacy. I attempted to avoid deriving support for my ideas from works that are emotional or biased to the point of being misleading or manipulative.

I hope that readers who consider their professional specialty to be hydrogeology or environmental geology are not miffed if I fail to give their specialties recognition at every opportunity. I do acknowledge their importance. The syntax would become cumbersome if I used the phrases "engineering geology, hydrogeology, and environmental geology" or "engineering geologists, hydrogeologists, and environmental geologists" at every opportunity, but consider them to be there if you like. Hydrogeologists and environmental geologists should know that engineering geologists have long been supporters of professional licensure, and should know that many engineering geologists also practice hydrogeology and environmental geology.

My principal findings and insights are the following.

(1) Geologists take justifiable pride in their personal, professional, and scientific integrity. This is the reason professional licensure is an emotional topic. Geologists react to a licensure proposal in terms of how it affects their sense of personal and professional pride, worth, and integrity. Some view licensure as a badge of honor that confirms their professional worth and integrity; others view it as an insult to what they believe are the basic tenets of professionalism. This divergence of views is a normal state of affairs given the present position of the profession as it travels toward maturity in recognizing its responsibility to the public.

(2) The only valid justification for regulating a profession by means of licensure (registration) is that the profession must be regulated in the public interest to protect the public health, safety, and welfare. Further, there should be no less restrictive and less onerous method of regulation that provides appropriate protection to the public. (For better or worse, there is no method of regulation less onerous than statutory practice protection to adequately protect the public.)

(3) Typical of the learned professions, a relatively small proportion of geologists join a professional association that has a strong code of ethics or that offers a certification program. Even for those geologists who do join such an association and become certified by it, the constraints are essentially voluntary. Loss of membership or certification, even for reasons of improper practice, does not remove the trespasser from the professional marketplace. Unfortunately, professional association certification, even though it has valuable features, is not a sufficiently effective means of protecting the public from poor practice.

(4) There is a considerable variation in the extent to which the various specialties of geologic practice affect the public health, safety, and welfare. Geologists whose practice directly and

extensively impacts the public health, safety, and welfare tend to favor licensure. Geologists whose practice impacts the public only indirectly and peripherally tend to disfavor licensure. In general, the first group includes engineering, groundwater, and environmental geologists and the second group includes petroleum and economic ("resource" or "extractive industry") geologists, and probably many academic and archaeological geologists.

(5) Some of the principal professional associations representing resource geologists recognize that engineering (and related) geologists have a valid need to be licensed. Yet, to grant licensure by statute to engineering (and related) geologists exclusively is to freeze their members out of a process that some need now, and many will need in the future. If resource geologists are not able to become licensed, they will be second-class citizens compared to licensed geologists, and their career mobility will be inhibited if they want to move into an area of practice for which licensure is required. Recognizing that licensure will become more widespread in the future, many resource geologists and their associations would like to have licensure laws passed that do not unreasonably restrict their practice. The Suggested Geologists Practice Act (Council of Professional Geological Organizations, 1993) has been endorsed by several professional associations.

(6) Licensure laws are based on the same fundamental principle as are professional codes of ethics: the professional must hold the protection of the public health, safety, and welfare to be more important than his or her interest or even the interest of the client or employer. Relatively few professionals join a professional association with a strong code of ethics. Licensure laws put this ethical constraint on the entire population of professionals subject to licensure.

(7) Licensure laws do not make professionals into perfect practitioners. Rather than requiring us to be perfect or making us perfect, a licensure law recognizes our human imperfections by setting limits on just how imperfect we are allowed to be and still be licensed to practice our profession as the geologist in responsible charge of the work on projects that fall under the purview of the public interest. Relatively low levels of imperfection are desirable; hence, the need for a law to establish those limits and enforce them.

(8) The argument that those involved in promoting professional licensure for geologists are motivated principally by a desire for money, monopoly, job protection, power, and turf protection does not stand up under even modest scrutiny.

(9) State and local government geologists, including especially those in regulatory agencies, should be licensed to perform substantive work or to supervise geological work.

(10) The basic purpose of a licensure examination is to determine if an applicant has the necessary minimum amount of knowledge, skills, and ability (competence) to begin practicing before the public in independent responsible charge of the work, and to supervise the work of others who are not licensed. Many geologists who oppose licensure do so in part because they fear failing the licensure examination. They have nothing to fear from a well-constructed, carefully administered licensure examination.

(11) The regulation of a profession practiced in the public interest is a method of indirectly regulating the professional's clients and employers who are not beholden to the public interest.

(12) Continuing professional education is very desirable. Imposing mandatory continuing professional education on the profession of geology is practical only if considerable flexibility is granted in meeting the requirements.

(13) While geologists who are opposed to licensure demonstrate great creativity in finding reasons and examples of why licensure is imperfect or undesirable, none of them are fatal flaws. The flaws can be mitigated if geologists and their professional associations will meet their professional obligation to make licensure work the way it should to benefit the public.

(14) Many of the critiques of the implementation and operation of licensure in recent years have some validity to them (see, for example, Pierce, 1983; McLeod, 1992; Nuhfer, 1992; Paschall, 1992; Winslow, 1992; Melton, 1993; and Echols, 1994), although the critics themselves are subject to comment (see, for example, Palmer, 1993; Peck and Adams, 1993; and Hatheway, 1994).

Yet even as these critiques were being made based on prior years of experience, events happened that largely negate them. The creation and growth of ASBOG has helped many geology licensure boards do a much better job (and better realize their missions) through shared learning and joint efforts. The quality and validity of licensure examinations is increasing. Now almost all exams are psychometrically valid and constructed with adequate professional geological input. ASBOG, as must individual licensure boards, has relied on members of the profession to volunteer for the hard labor of examination construction and grading. Doing this on a national scale has brought members and leaders of the geology profession together in an atmosphere that helps them and their associations realize the type of dedication they must have to make licensure work optimally.

The Suggested Geologists Practice Act (Council of Professional Geological Organizations, 1993) incorporates many strong and varied (and workable!) enforcement options for a licensure board and these ideas are gaining acceptance.

The California State Board of Registration for Geologists and Geophysicists was mired in a "do-nothing but give exams mode" for two decades; to be fair this was not always the board's fault, but it suffered much criticism as early as the late 1970s (see, for example, Summerfield, 1978). Now, with prodding from the profession (and a few legislators), with fresh leadership and board members (all of whom, including the public members, are talented, savvy, and hard working), and with dedicated input from the members of the profession who serve on its committees, the board is well on the way to reinventing itself as an energetic, holistic, mission-oriented board. The earlier criticisms no longer stand. Those who made them should take a fresh look and be part of the revitalization of the board.

(15) Slow acceptance of licensure is a normal process as a profession matures and comes to grips with the facts of professional life. Parker (1990) says, "History tells us that the evolution of professional registration is a slow and, yes, sometimes painful process." The challenges to licensure that arise within our profession are typical of those that arise in other professions in the early stages of licensure implementation.

For example, according to Prasuhn (1995), the American Society of Civil Engineers (ASCE) opposed registration for civil engineers from 1897, when it was initially proposed, to 1935, even though ASCE adopted a model law for registration of civil engineers in 1911. This opposition was on such bases as, "ASCE membership, and ASCE membership alone, was adequate to ensure technical competency and safeguard the public" (Prasuhn, 1995).

If it took 38 years for professional opposition to licensure to convert to support in the engineering societies, how long will it take the geologists? The first geology licensure statute was Arizona's in 1956. The ball really got rolling with the California Act in 1968. 1956 + 38 = 1994. 1968 + 38 = 2006. On a national level, I think we are getting close to the unanimity of the engineers. Pockets of opposition exist and will always exist, and this is natural. It seems that the professional maturity of geology (as to licensure considerations) is growing at about the same rate as it did in engineering. We just started later.

Licensure comes when a large majority of the members of a profession that impacts the public health, safety, and welfare are comfortable with it. Licensure comes when a profession is mature enough to accept it.

Robert E. Tepel
San Jose, California
August 1995

Acknowledgments

Most of this book appeared in the form of quarterly essays in AEG News, the news magazine of the Association of Engineering Geologists. This book collects the essays, some of them considerably updated and revised, in one volume. I am grateful to William K. Smith and Abdul Shakoor, editors of AEG News when these essays were published, for their willingness to publish them.

A common definition of "essay" would be an interpretive or analytical literary work treating the subject in a more or less limited or personal way. Although my personal concepts are very evident in this book, I would like to think that what I have learned from others and incorporated in my writing broadens the chapters a bit from the style and content of limited, personalized essays.

Looking back on the several years it has taken to get to this juncture, I am amazed at the number of people, both geologists and nongeologists, with whom I have had contact on issues in professional licensure. My work in ASBOG, the National Association of State Boards of Geology, in developing, grading, and maintaining its licensure examination; my work as a grader of the California geology, engineering geology, and hydrogeology examinations; my participation in the development of the Suggested Geologists Practice Act; and my service as an officer, board member, and committee manager in the Association of Engineering Geologists have provided entry into the power structure of professional licensure for geologists in the United States.

I have had substantial, focused, discussions of the issues in professional licensure for geologists with more licensing board members, more licensing board administrators, more psychometricians, more engineers, more geologists, and more members of the leadership of other professional associations than probably any other geologist in the last 7 years. I have collected probably more literature on professional licensure for geologists and studied it than anyone else during the same time period. These contacts and studies guided my research and are the basis of my opinions. I know I still have much to learn, but now is the time to put what I have learned in book form.

All my contacts deserve my acknowledgment and thanks, for all of them helped me clarify my ideas. I acknowledge those who challenged me, sometimes strongly, in their letters to editors. I acknowledge the geologists, engineers, journalists, economists and other social scientists, consumer advocates, and politicians whose works I have encountered and from which I have benefited. I crossed swords with many of them—and benefited. Many of these kind souls have been supportive; others seem to be mesmerized by views for which I find no foundation, or are driven by some mysterious need to assign (unjustifiably, in my opinion) nefarious motives to those who favor professional licensure for geologists. Nonetheless, my thanks to all of them.

I beg forgiveness if I acknowledge below only a few of those who gave positive reinforcement.

John W. Williams, Ph.D., RG, CEG, CHG, who started me on the journey by appointing me manager of the AEG Committee on Professional Registration for Geologists in 1988.

Patrick J. F. Gratton, CPG, whose leadership in the Division of Professional Affairs of the American Association of Petroleum Geologists made it possible to bring together a group of diverse and cantankerous geologists that became known as CoPGO and hammered out the Suggested Geologists Practice Act. Several of the chapters in this book are based on CoPGO discussions, and I thank all the CoPGO participants for their part.

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I acknowledge with thanks all my fellow CoPGO working group members, ASBOG Subject Matter Experts, AEG Board members, and the readers of my essays who have encouraged me directly or indirectly with their support and shared insights.

Nonetheless, as usual, I remain solely responsible for any errors of concept, fact, or logic that reside in this work. Opinions expressed in this work are not necessarily those of any person acknowledged above, nor of their employers or organizations in which they might serve or hold membership.

Chapter 1

Why Do Geologists Have Divergent Views On Professional Licensure?

An Awakening

Every once in while an insight comes along and hits us hard enough that we realize it was there, gently tapping on the door of our minds for too long a time without gaining admission. In June 1990, I was listening to a panel discussion of professional licensure for geologists sponsored by the Division of Professional Affairs of the American Association of Petroleum Geologists. If you know anything about licensure battles, you know that resource geologists tend to doubt the value of licensure and engineering geologists, hydrogeologists, and environmental geologists tend to favor licensure.

During the sometimes impassioned discussion that followed the panelists' presentations the proverbial light bulb lit in my brain, flashing the message "PRIDE AND PREJUDICE." Months later, I felt the same vibrations at a meeting in Reno. This meeting was about professional licensure for geologists, and was sponsored by the Geological Society of Nevada. The GSN membership is mostly economic geologists.

In both arenas, I'd heard all the arguments before. What struck me was the sense of pride these people had about being resource geologists, and their pride in their contribution to the well-being of the human race. Well, they are justifiably proud of their profession and its contributions, just as engineering geologists are justifiably proud of their profession and its contributions.

The "pride" part of the insight is this: resource geologists, on the whole, are darn proud to be independent, solely responsible for their success or failure, and want to be judged by the success of their geologic and business achievements in the most open business environment possible. That means no or minimal government regulation. They believe that the market will evaluate and judge whether they are competent, and they are willing to live and die with the market's call. They place higher value and more confidence in the judgment of the market than they do in the judgment of the government. In summary, the typical resource geologist—especially the typical independent petroleum or economic geologist—is darn proud not to be licensed.

The Role Of Pride

Is there anything wrong with this pride we all have? No. My insight is simply that it is important to recognize that we are all slightly vain creatures who sometimes overreact due to our (generally justifiable) pride in what we do and who we are. My appeal to all scientists who are stakeholders in these issues is simply this: acknowledge your justifiable pride in who you are and what you do, and acknowledge that your outlook on life has an impact on the way you react to the concept of professional licensure.

It is impossible to remove emotional responses from our minds as we investigate the issues in professional licensure. We are investigating a political matter, not a physical one. But we scientists are trained, when dealing with the physical world, to create dispassionate evaluations of causes and unbiased explorations of hypotheses. We can develop hypotheses carefully, research what the rest of the world knows, avoid rhetoric and bombast, avoid patently unsupportable assertions stated as fact, and cite a reference once in a while. I have tried to do this in my own thinking, but I know enough to not claim total success.

It is impossible to remove emotional responses from our minds ...

The Role Of Prejudice

Geologists

Our (justifiable) pride predisposes us to be a bit prejudiced on occasion. Our world view grows from our life experiences. We develop criteria that allow us to determine our attitude about many situations with only passing consideration of a problem, such as professional licensure. We can change our mind if we see convincing evidence.

Another, harder, kind of prejudice we encounter in discussing issues in professional licensure is noticeably on the decline. I think it will continue to decline, at least among geologists. The major symptom of this type of prejudice is the assignment of reprehensible motives to others without supporting hard data and rigorous analysis, that is, on the basis of casual, biased, and emotional interpretation of circumstantial evidence. I applaud the petroleum geologists who spoke from the audience at the AAPG meeting because they rose above this prejudice. Indeed, the reason the light bulb in my brain flashed "prejudice" was that it was notable for its absence.

Examples of the unjustified motive assignment prejudice are statements such as "One is forced to conclude that those in favor of licensure only want it so they can overcharge the public and line their own pocketbooks," or "Clearly those in favor of licensure only want to create and perpetuate a `good of boys club' and restrict entry into the profession." I have never seen statements like these backed up by thorough, documented, research. Some of these fallacies and myths are examined in Hoose and Tepel (1990); others are examined in Chapters 6-8 and 21 in this book.

Of course, prejudice is not a prerequisite for emotional or biased writing. An article or letter may be written in emotional or biased terms simply because it suits the purpose of the writer as an advocate.

Economists and Social Scientists

Economists and social scientists often seem to write their "scientific" papers as debaters would. They write as partisan advocates seeking to prove the correctness of a point of view or conclusion by developing strong arguments favoring one side and giving the short shrift to opposing arguments. The conclusions they draw are merely a reflection of their own prejudicial premises. Attempting to apply the scientific method as learned in a geology curriculum to evaluate the work of some economists brought new insight into why economics is called the dismal science.

Newspaper and magazine reporters usually write about licensure with a biased point of view. They dearly love to "validate" their thinking with peppery quotations from economists and their ilk. These writers compound their own prejudice with that of the economists they are quoting.

Should geologists be concerned about what the economists, social scientists, and journalists say about professional licensure? Yes, because politicians who pass and amend licensure laws pay more attention to them than they do to geologists. Yes, because geologists who cite the studies of economists in support of their views of professional licensure may be citing studies that would not stand up to the scrutiny of any geological journal's peer reviewers. It is folly to cite such studies on the assumption that they represent thorough and unbiased scientific investigations such as we employ in the physical sciences.

Personal Outlook And Attitude About Licensure

It would not be an overgeneralization to say that resource geologists have a healthy dose of entrepreneurial spirit, and that they view governmental regulation as an impediment to progress and entrepreneurial freedom. If the "government" (say, a Board of Registration) tells some typical resource geologists that they must suddenly now be registered, or if an outside group (such as engineering geologists or hydrogeologists) proposes professional licensure for geolo-

gists, the resource geologists typically react as though their professional pride and sense of integrity were being insulted. Indeed it is in their minds, although this is not the intent of those proposing licensure.

Licensure, in the minds of many resource geologists, represents the "government" telling them that they are not good (perfect) enough, and that they need to have the government ("Big Brother") watching over them and evaluating their work. Given their entrepreneurial spirit and parallel mistrust of the competence of government at any level, it is no wonder that many resource geologists hit the ceiling when licensure is proposed.

Even if the proposed licensure law exempts them, some resource geologists tell me they will still oppose it on the general suspicion (a sure thing, in their minds) that somehow, somewhere, some future bureaucrat will find a way to say that the law applies to their activities. And, when the law is said to apply in that hypothetical future situation, they just know that such application will be another stupid, unnecessary government regulation and they want to nip such regulations in the bud right now, while they have a chance, by opposing a licensure law. They are, in effect, making a value judgment that the future costs of licensure to them are greater than are the future benefits of licensure to the citizenry.

I admire the professional spirit and dedication of resource geologists. Theirs is one of the few fields of human endeavor left today in which a single scientist or a small team can, on the basis of intelligence, education, experience, insight, and entrepreneurial guts, make a discovery that benefits our society in a large way because of its tremendous economic impact. Their chosen work has allure, lore, spine-tingling tales of risks taken—and prizes won and lost; in short, it has romance.

In the romance of resource geology, the government plays the role of the bad guy or no role at all (except for the occasional tip of the hat to the researchers at the USGS or USBM). What type of person would be attracted to a career as a resource geologist? A self-confident, independent, risk taker who thrives on the freedom to compete in the market and who is willing to live or die professionally with the market's call on his or her entrepreneurial and scientific efforts. Probably someone who believes strongly in free competitive enterprise and limited government. Someone who thinks that private enterprise can do almost any chore in our society better than government. Would this type of person welcome government interference with his or her practice in the form of licensure, however benignly instituted? Of course not. Would they believe that private peer certification is better than government licensure? Probably yes.

Engineering geologists, hydrogeologists, and environmental geologists, on the other hand, are by and large darn proud to be registered (licensed). Yet—and this is a critical point for the resource geologists to understand—the great majority of engineering geologists also live and work in a competitive market environment. They, too, are judged by the market. Engineering (and related) geologists seem to be proud to have a government board of professionals evaluate their credentials, test their knowledge, skills, and abilities, and mail them a certificate they can hang on the wall. To them, the certificate says, among other things, they have been judged by their peers convened under statutory authority and found ready to participate in the competitive marketplace, to serve the public in the practice of their profession.

The allure, the lore, the risks and rewards, the romance of engineering geology and hydrogeology practice are certainly not as spectacular or as easily told as they are in resource geology. Engineering geologists and hydrogeologists have no Drake Sand, Signal Hill, Spindletop, Bingham Canyon Mine, or Carlin Trend that are part of our nation's folklore. We have some massive infrastructure projects in water resources or transportation that, when successful, are almost invisible and little remarked upon despite their large contributions to the people of our nation. Our major business risk (aside from earning a living) is getting sued. We often deal in failures instead of successes, e.g., St. Francis Dam, Teton Dam; the Gros Ventre, Frank, and Palos Verdes landslides; deep land subsidence and mined land subsidence; insidious failures from expansive soils (smectite clays,

the Pierre Shale); faults and earthquakes; contaminated groundwater and soils; and karst and shoreline processes.

What type of person would be attracted to a career in engineering geology and hydrogeology? They might well be entrepreneurial; most of them work in private enterprise in a very competitive market environment. They take pride in putting theory to work in a practical way for immediate problem solving. Daily, they see ways that geologic decisions involving public policy impact the lives and bank accounts of citizens. They see the losses that members of the public, and the public at large (taxpayers) suffer when geologic hazards are ignored or poorly recognized. They take pride in using their geologic knowledge and skills to prevent and control adverse geologic impacts that can harm their clients and the public.

If an economic geologist misses a beat, usually the primary adverse consequence is that the investors lose money. If an engineering geologist or hydrogeologist slips a cog, people can die, become injured, get sick, or lose money. The primary consequences of substandard practice are more severe in terms of their effects on people as individuals and families. Would a person who makes a career of geologic practice that critically impacts the public health and safety want some effective means to keep the outright charlatans out? Would they want some effective means to provide a level of assurance about the abilities of those who claim to be trained and experienced in the profession? Are they likely to favor statutory professional licensure even if devoted to free competitive enterprise? Yes.

Engineering geologists are more accepting of government regulation than are resource geologists. That does not necessarily mean that engineering geologists are more trusting of "government," just that they have decided that the costs and risks of regulation ("watching the watchdogs") are worth the benefits they bring to the public. This attitude might come from two sources: (1) the nature of engineering geology practice, which puts the engineering geologist face-to-face with the client whose life will be affected by the engineering geologist's decisions, and (2) the close association engineering geologists have in the workplace with civil engineers and architects, for whom professional licensure is universal and well accepted.

Geologists' lack of professional unity in accepting either statutory licensure or professional association (peer) certification is well explored by Cutcliffe (1982), Nolte (1988), and Slayback (1988, 1990). Davis (1993) offers a novel insight on the division of thought among geologists as to the merits of licensure. His division of geologists into two camps parallels mine, but from a different point of view. He divides geologists into those who "create wealth" through their work in productive industries, that is, the resource geologists, and those who "distribute wealth" through their work in the service areas of the profession, especially consultants. He notes that licensure is simply the way things are done in the service areas of the profession of geology, and in other professional service areas.

Conclusions

It is easy to read the works of economists, social scientists, reporters, and attorneys who write on professional licensure issues and not realize that we are reading advocative, and therefore biased, works. Beware the plausible, but unsupported assertion presented as a reason or conclusion. Take care, fellow scientists, in citing advocative works in professional licensure matters. Recognize them for what they are, either honestly advocative or biased and passionate to the point of being unfair and misleading.

The nature of the work they do and their basic outlook on life will affect the way geologists evaluate the concept of professional licensure. As a generalization, resource or economic geologists tend to have an outlook that raises serious concerns in their minds about government regulation. While engineering and related geologists may share these concerns, they are willing to accept (or promote) regulation by statutory licensure because they see the benefits to society being worth more than the costs to the profession.

Chapter 2

Professional Licensure: What Is "Professional" And What Is "Licensure"?

Introduction

Geologists, as great lovers of logomachies,* always start on an idea journey with definitions. Nothing could be more fundamental to a discussion about professional licensure than understanding of the meanings of the words "professional" and "licensure" in the proper context.

What is professional licensure? It is part of a larger concept called "occupational licensure," a catchall term favored by economists, psychometricians, and social scientists [see, for example, Shimberg (1982) and Young (1987)]. When we talk about professional licensure for geologists, we are discussing occupational licensure in a special case in which the occupation is a profession. Occupational licensure is a method of regulating a trade, occupation, or profession characterized by the licensure of individuals engaged in it conferred by a governmental agency or board. Other methods used to regulate a group include the regulation of the industry rather than the individuals comprising it (the way the banking industry is regulated, for example) or through the authorization of a self-regulating organization.

What is professional licensure? It is easier to define the term than to define its parts. Brown (1989) provides a definition I'll modify slightly here: professional licensure is the implementation of a state law that defines the practice of a given field of professional activity, establishes minimum standards for its practice, provides procedures for evaluating the qualifications of applicants to practice and the issuance of licenses to practice, and provides penalties for persons practicing without being licensed and for licensed persons practicing improperly.

What Is "Professional"?

What is professional? Stover (1990) lists the necessary attributes of a profession as "the existence of a body of specialized knowledge requiring advanced study; the application of such specialized knowledge or skills, primarily of a mental rather than physical nature; professional standards governing practice of the profession, often shown by a code of conduct; an organized body of practitioners; and the exercise of skill and judgment on behalf of the client or employer."

Stover (1990) dismisses claims to the title "professional" by, for example, dry cleaners and house painters, and provides a rationale for denying the title to such occupations as banking. Clearly, although bankers, painters, and dry cleaners might aspire to use the title "professional" either for social status or for marketing zing, they do not meet the core definition of the word that we want to apply to geologists, engineers, architects, and other design professionals.

The existence of a body of knowledge consistent with professional stature is generally recognized if it is broadly taught in college curricula leading to a baccalaureate degree. The mere fact that a baccalaureate degree is offered in a field of study does not automatically make that field a profession. It is just one qualifying element among several.

* Logomachy: a discussion about the meaning of words.

Ladd (1980) adds the criterion, "they [professionals] exercise control over the nature of their job and the services they provide." Kennedy (1986) remarks of professionals, "the parties they serve may not fully comprehend what is being done for them." And Schoen (1983) notes, "We look to professionals for the definition and solution of our problems, and it is through them that we strive for social progress. In all of these functions we honor what Everett Hughes has called `the professions' claim to extraordinary knowledge in matters of great social importance and in return, we grant professionals extraordinary rights and privileges." Schoen (1983) also provides this comment on the nature of professional practice: "The situations of practice are not problems to be solved but problematic situations characterized by uncertainty, disorder, and indeterminacy." Professional work is varied as opposed to routine. Professional work is defined in regulations issued under the Fair Labor Standards Act, codified in Title 29 (Labor) of the Code of Federal Regulations (CFR), part 541, section 301 (29 CFR 541.301 et. seq.). The code recognizes three groups of professions: the "original," "traditional," or "classical" professions (medicine, law, and theology); the "learned" professions; and the "artistic" professions. Geology would be classified as a "learned profession" under the heading of "engineers and scientists" [29 CFR 541.302 (e)(1)].

What is licensure? Confusion abounds in the way different groups...define and term.

Table 2-1 lists the CFR criteria to determine if a given position is professional. (The salary listed in Table 2-1 is low by current standards because it has not been updated for inflation since the regulation was written many years ago.)

One of the prime characteristics of professional work is that it requires the consistent use of discretion and judgment (29 CFR 541.305) in the application of special knowledge. Ginsburg and others (1989) explain the exercise of discretion: "An employee who exercises discretion or independent judgment is able to make decisions freely without needing to consult a superior. The work must require the employee to compare and evaluate possible courses of conduct and act or make a decision after various possibilities have been considered. This decision-making power should be real and substantial, free from immediate supervision, and exercised with regard to matters of consequence."

"Judgment" is a poorly understood term. Judgment is not casual nonquantitative guesswork referred to as an "assessment" to hide a lack of rigor. Judgment is a specific process, with its own rules of logic and syntax (Fish, 1950). Judgment is, in essence, a structured problem-solving process we use when confronted with questions that cannot be answered by mathematical analysis alone. These are "questions of which the immediate factors bear no mathematical relation to the answer, and the answer therefore cannot be computed" (Fish, 1950). Whereas a mathematical approach is necessarily based on deductive thinking, judgment processes are more likely to call for inductive thinking.

Judgment is best developed by practice. Judgment is "the intelligent use of experience" (Einstein, 1991). A professional with well-developed judgment skills "can quickly recognize [the] preponderating factor or group and sense its influence on the answer" (Fish, 1950). Judgments are commonly made on the basis of insufficient information. Clearly, the ability to make shrewd judgments is valued in professional practice.

The existence of professional licensure is another characteristic that rounds out the definition of "profession" for those professions that impact the public health, safety, and welfare [see Prasuhn (1995)].

Finally, as also noted in Chapter 5, we professionals are constrained to take the public's interest into account in doing our work, and we retain ultimate responsibility for our work in the sense that, when things go wrong during construction (changed conditions) or with the completed project (the roof leaks, therefore the foundation exploration was inadequate) it is the design professional who is sued, not the driller who drilled the exploratory borings and took the

samples, not the technicians who drafted the plans, and not the tradesmen who built it.

What Is "Licensure"?

What is licensure? Confusion abounds in the way different groups and authorities define the term. When we geologists refer to the level of licensure as "registration" we tend to think of it as the highest level of control available to be imposed on a profession. This is commonly called "practice protection."

"Licensure" is also a general or collective term for any or all of several types of occupational regulation. As a general term, it can include terms such as registration, certification, and (practice protection) licensure.

Others assign to "registration" the lowest, most lenient, level of control. For example, Brinegar and Middleton (1990) describe the hierarchy thus: "`licensure' is the most restrictive form of state regulation. Under licensure laws, it is illegal for a person to practice a profession without first meeting the standards imposed by the state. Under `certification,' the state grants title protection to persons meeting predetermined standards. Those without the title may perform the services of the occupation but may not use the title. `Registration' is the least restrictive form of regulation that usually takes the form of requiring individuals to file their name, address and qualifications with a government agency before practicing the occupation." These definitions are generally in accord with the definitions given in Black's Law Dictionary, fifth edition (Nolan and Connolly, 1979). Perhaps the "registration" accorded to "Registered Environmental Assessors" in California is a good example of the low-grade (least restrictive) concept of the meaning of "registration."

The confusion between "registered" and "licensed" may have originated in the mid-1920s, when a predecessor to the National Council of Examiners in Engineering and Surveying adopted a "model law," presumably a practice act. It is noted by Curtis (1988) that "Various issues included agreement that engineers should be `registered' not `licensed'...." The use of "registered" instead of "licensed" for the highest level of licensure (practice protection) in the design professions would seem to predate the independent development of licensure terminology in the social sciences. We have two nomenclatures originating in two fields of study, hence the confusion. The pendulum has now swung the other way. In 1995, NCEES (Thomas M. Stout, personal communication) resolved to implement a global change in its model act, substituting "licensure" for "registration" and "licensed" for "registered."

NCEES now conforms to the definitions given in Black's Law Dictionary (Nolan and Connolly, 1979) and used by Brinegar and Middleton (1990).

In this book I use "licensure" as a general term when necessary to include licensure, registration, and statutory certification. I also use "licensure" as the equivalent of "practice protection" on the basis of its law dictionary definition and because it is used that way in the very extensive literature of social scientists and psychologists. Where the term "registration" is used officially, as in "State Board of Registration for Geologists" and where text I quote uses "registration," I remain faithful to such use of the term by others. Context may also require reference to "registration," but it means "practice protection licensure" unless otherwise specifically defined.

Appendix 1 lists definitions related to occupational licensure terms such as "licensure," "registration," and "certification." Be aware of the different definitions of terms such as "licensed," "registered," and "certified" when you talk or read about professional licensure. Your conversational compatriots or the author you are reading may have a different definition in mind than you do.

Conclusions

Professional work is characterized by advanced learning, the exercise of discretion and judgment on behalf of others, variety, and a predominantly intellectual work product. Additional identifying characteristics are professional standards (often shown by a code of conduct), an organized body of practitioners, the exercise of control by professionals over the nature

of their job and the services they provide, and the likelihood that the professional's clients or employer may not fully comprehend what is being done for them. Geology is a learned profession as defined in 29 CFR 541.302.

Registration, as the term is commonly used by geologists and engineers, is the highest (most restrictive) level of control by state licensure of individuals practicing a profession (that is, practice protection). Practice protection licensure is (except for grandfathering) supported by a formal examination requirement. It appears that professionals will be moving away from their use of the terms "registration" and "registered" to refer to practice protection licensure and adopting the terms "licensure," "licensed," and similar terms to refer to practice protection licensure.

Certification, with respect to occupational licensure, is title protection under a state law, and an examination is generally required. Certification also can refer to the credential review procedure offered to their members by some professional associations. Several professional association (private) certification programs are described in Johnson (1989). In geology and related earth-science fields, such review is not always supported by an examination, and the examinations that are extant may not be constructed and graded in accordance with current psychometric standards. In engineering and related technical certifications, examination as well as recertification requirements are common, as is the use of psychometric consultants (Thomas M. Stout, P.E., written communication).

A state law that is a "definition statute" is not a licensure law. There is no state-constituted licensing board or office, no examination, no review of credentials, and no independent enforcement potential.

Table 2-1. Characteristics Of Professional Work

[Based on 29 CFR 541.301, et. seq. (edition of July 1991), and Ginsburg and others, (1989)]

Professional work requires

A. Educational background or activities

1. The acquisition of advanced knowledge through a prolonged course of specialized intellectual instruction in a field of science or learning, or
2. The work is original and creative in character in a recognized field of artistic endeavor, or imagination, or
3. Teaching for a school system or educational institution, and

B. Discretion: work requires the consistent exercise of discretion and judgment in its performance, and

C. Work Product: predominantly intellectual, varied in character, and cannot be standardized in relation to a given period of time, and

D. Work Responsibility: must devote not over 20% of work hours to activities not essential, part of, or necessarily incident to the work, and

E. Compensation: is paid not less than $170.00 per week exclusive of board, lodging, or other facilities.

Chapter 3

Peer Certification Or Statutory Licensure: Which Serves The Public Better?

Introduction

If the practice of a profession vitally impacts the public health, safety, and welfare, the public has an interest in such practice and has the right to regulate the profession so that the public's interest is served. Geology is such a profession.

There are several ways of implementing control on a profession such as geology. In my opinion there are only two ways that are potentially effective in the context of our culture and precedent in the United States: by statutory licensure through state licensure laws, or by professional association certification, also called peer certification. Which way has the highest potential to serve the public in all necessary aspects?

Basic Aspects Of Peer Certification And Licensure

Peer certification and statutory licensure certainly can coexist, but the two are very different creatures. Peer certification is private accreditation. Professional licensure by statute is public regulation. The first duty of a professional association is to serve its members and the profession. The first duty of a statutory licensure board is to protect the public. There is a distinct contrast in missions.

A professional association can and should undertake a variety of activities that serve the public interest, and encourage its members to do likewise. However, a professional association that tries to protect the public through a peer certification program is really trying to serve two masters (its members and the public) who may, at times, have conflicting interests. I am far from saying that professional associations (certifying or not) have no role to play in licensure or licensure board operations. It is the contrast of missions that gives professional associations a strong, necessary, and very important role to play in the operation of a statutory licensure board.

A state licensure board operates from statutory base that gives it authority to enforce its standards on all geologists, would-be geologists, and pretender geologists by applying any of a significant range of penalties. The disciplinary options of a professional association amount to little more than denying membership. In many cases, the member found culpable of ethical violations is allowed to resign rather than having membership terminated.

Because membership is voluntary, and human nature being what it is, professional associations seldom reach close to 50% of their membership potential, and therefore cannot impose their standards on a significant number of practitioners. Nolte (1988) notes that

"To be effective, peer certification must be unified and supported by the entire profession. A significant percentage of the profession must be certified and professional certification must have public recognition."

Has peer certification met this goal? In 1991 the American Institute of Professional Geologists had a total membership of about 4,500 Certified Professional Geologists (W. V. Knight, personal communication). From the North American Survey of Geoscientists (American Geological Institute, 1988, their table 2) we can glean that the number of geologists in the United States was then about 51,000. AIPG's Certified Professional Geologists therefore constituted about 9% of all U.S. geologists as of few years ago.

Peer certification, more than licensure, is open to the charge of being uninterested in consumer complaints because it is operated by a closed group not ultimately answerable to the public through the political processes of democratic government. No professional geologic association has yet demonstrated that its certification program meets the NOCA (National Organization for Competency Assurance 1980-85) standards and received NOCA certification.

... a remarkable transformation takes place...

A state board of licensure is a public body, a unit of government, and its operations and books are open to public scrutiny. Few professional societies seem to be willing to undertake this level of commitment to the consumer of professional services and to the public.

Tables 3-1 and 3-2 summarize my opinions on the principal drawbacks of professional association peer certification and the principal advantages of professional licensure by state law. Unfortunately, peer certification, although it has many merits, is not a sufficiently effective means of protecting the public from poor practice.

Role Of Professional Associations In Licensure Board Operations

All this certainly does not mean that professional associations have no role to play in licensure or the operations of a licensure board. Far from it. Professional associations have a critical role to play, and if they fail to play it, everybody, the public, the board, and the associations, loses.

Professional associations must assure that statutory licensure lives up to its potential. It is the contrast of missions that makes professional associations not only useful, but also very much needed, in the proper operation of a licensure board. The two forces check and balance each other such that neither can run amok and become self-serving to the detriment of the public (or the profession, for that matter). Each is the conscience of the other. Curtis (1988) remarks: "Although the Boards function as agencies of the state, they maintain an association with major (professional) societies. Some tension develops here, because the states must maintain control of the boards to ensure their protection of the public interest and to see that the societies do not exert undue influence on the boards."

Historically, professional associations have been leaders in the development of practice standards and ethics. These standards support the licensure board's

standards. The associations have a leadership development ladder through their sections or chapters, committees, and officers. These leaders can bring their expertise to bear on behalf of the public when they serve the licensure board as Subject Matter Experts or on board committees or as board members. This most certainly does not mean that the licensure board is dominated by the professional associations. Far from it, as explained in the following paragraph.

I have observed that a remarkable transformation takes place when geologists move into licensure board service. Barbara Wilkerson, an administrator with the Georgia Examining Boards Division, remarked to me (personal communication) that she commonly sees this transformation occurring when professionals join a variety of boards in Georgia. Quite simply, professionals have no trouble "changing gears" when they move into board services. They can and do change their allegiance from serving the profession to serving the public as they move from a private association position to a public board position. This is testimony to their consummate professionalism. Using one's professional expertise to serve the public beyond the bounds of serving one's profession is the ultimate expression of professional dedication.

Table 3-1. Principal Drawbacks Of Professional Association Peer Certification Programs

1. The first duty of a professional association is to serve its members and the profession, not to serve the public.
2. Professional association certification has little to no legal standing and, with rare exceptions, places no legal obligation on those certified.
3. Professional association peer certification is entirely internal to the professional association. It does not occur in a public forum. Public (lay) representation on professional association certification boards is rare.
4. A practitioner can lose professional association certification through nonrenewal of membership or, through disciplinary action and still practice in responsible charge of the work, without a state licensure law.
5. Professional associations cannot impose their standards on any group except their own members. Because membership is voluntary, a significant proportion (sometimes the majority) of practicing professionals do not and will not come under the purview or influence of any certifying professional association.
6. Any professional association that certifies the qualifications of its members, and therefore by implication warrants the standards of performance of its members, must stand ready to defend itself and its officers and board members against claims and lawsuits.
7. If a national association were to become the professional regulatory body for geologists, both the public and the regulated professionals would be distanced from the regulators. Traveling to a meeting of a state board of licensure is more convenient than traveling (probably out of state) to a distant city to attend a meeting of a national association that is the professional regulatory body.
8. Professional associations can discipline individual members, but not business firms. Their discipline is essentially limited to denial of membership.

Table 3-2. Principal Advantages Of Professional Licensure Through A State Law

1. The first duty of a state licensure board is to protect the public.
2. Licensure provides legal standing and acceptance of one's qualifications as an expert witness in state courts and before state regulatory bodies. Licensure puts an affirmative legal responsibility on practitioners and provides specific legal basis for redress.
3. Licensure provides the public with a regulatory system that has accountability to the voters through the political process. It is common to find one or more public members on state boards of licensure. State licensure provides a broader set of checks and balances in the context of a democratic society than does professional society certification.
4. If state licensure is lost, the practitioner can no longer sign a document as the legally responsible geologist. Without state licensure, a practitioner can drop or lose professional society certification and still continue to practice independently or sign reports as the responsible geologist.
5. Because a state licensure board is a public body, its operations are open to public scrutiny. This benefits the public and the consumer of the regulated services. A state licensure board will send its meeting announcements, agendas, and minutes to anyone who demonstrates a valid interest. Licensure board meetings are open to the public. No professional society seems to be willing to undertake this level of commitment to the public.
6. A professional licensure law casts a far wider net than does a voluntary professional society certification program. Far more practitioners are subject to the jurisdiction of a board of licensure than are subject to a professional society's standards. By means of a Certificate of Authorization for businesses, business firms, as well as individual practitioners, can be brought under the purview of a board of licensure. A licensure law with this feature offers the public more protection. No professional association certification program can discipline business firms in addition to individual practitioners.

Chapter 4

What Is The Role Of Specialty Licensure?

Introduction

Specialty licensure or certification is the licensure of professional practice specialties under either title protection or practice protection statutes. Antrim (1989) notes that "...the complexities of present-day technologies [have] led to the creation of...specialties. The expertise needed to practice competently in a specialty area has brought many practitioners to believe that special credentialing is needed to verify that the claimed expertise is real." Specialty certification might also be offered by professional associations or boards created by professional associations (see, for example, Antrim, 1989).

The subject is controversial (see, for example, Nuhfer, 1992; Paschall, 1992), and emotional. Statutory specialty licensure exists and, largely because of its "title protection" nature, does not seem to have interfered significantly with the practice of geologists who have a license to practice geology but no specialty license.

In the world of engineering licensure, structural engineering, geotechnical engineering, and some other specialties have had some acceptance as title-protected specialties under civil engineering statutes.

History Of Specialty Licensure

In geology licensure laws, specialty licensure started with the California registration act, which became effective in 1968. According to Neel (1979), referring to the then current licensure act, "At the insistence of the A.E.G. and the City of Los Angeles, the bill includes specialty certification of engineering geologists." Specialty licensure for engineering geologists was supported by the regulatory engineering geologists, who had been receiving unsatisfactory engineering geology reports from experienced geologists

who were inexperienced in engineering geology. The regulators wanted to receive reports only from experienced engineering geologists.

The concept of specialty licensure in the California geology registration act was not welcomed by then relatively new American Institute of Professional Geologists (AIPG). The concept was favored, at least on a local level, by members of the Association of Engineering Geologists (AEG) (Galster, 1982). The scars from this battle have hardened into still currently held strong positions by geologists on both sides of the issue. In 1990 AIPG adopted a policy on Specialty Certification/Registration that opposes specialty licensure (American Institute of Professional Geologists, 1993). Although AIPG participated in the 1989—1990 drafting the Council of Professional Geological Organizations Act (Suggested Geologists Practice Act, or SGPA), it has not yet endorsed it because the SGPA included specialty licensure (Christopher C. Mathewson, personal communication). The SGPA was published by AEG [see Council of Professional Geological Organizations (1993)].

The licensure acts of Arkansas, Georgia, and Oregon are based on the California act and include specialty licensure provisions. In these cases, the specialty licensure is via title protection. In 1995, specialty licensure, again by title protection, was created for hydrogeology in California. In recent years the licensure acts proposed in Washington and Texas included specialty licensure for engineering geology.

Options To Statutory Specialty Licensure

Options to statutory specialty licensure have been presented from time to time. In essence, these generally reduce to either professional association certification by the relevant specialty professional associations, or some type of independent "board certification," such as is commonly found in the medical profession for physicians. Johnson (1989) includes several papers on specialty certification as implemented by professional associations and as implemented or proposed in licensure statutes.

If a professional association is liability conscious and views association certification programs as primarily being business enhancement tools for members rather than public protection tools, it will tend to favor statutory specialty licensure. For example, during my presidency of AEG I used a questionnaire to gauge the thinking of the membership on the issue. Very few members were in favor of an AEG peer certification program in engineering geology; however, many wanted AEG to promote professional licensure for geologists and engineering geologists. Galster (1982) indicates that at one time AIPG was considering offering specialty peer certification in engineering geology, but AEG opposed it.

Other technical or professional associations have no qualms about certification, handling complaints, being sued by any of several parties to a disciplinary action, or creating and administering examinations. Their certification programs are useful because they help the profession as a whole work toward some level of standards. Peer certification programs are sometimes viewed as an interim surrogate for statutory licensure. The disadvantages of association peer certification programs are discussed in Chapter 3.

Specialty licensure might have some disadvantages. Just because it is controversial, it stirs up professional emotions. If carried too far, it could lead to fragmentation of practice and non-productive arguments within the profession. Antrim (1989) lists many advantages and disadvantages of specialty licensure or certification.

Role Of Specialty Licensure

Specialty licensure can be said to offer additional assurance to the public by requiring special qualifications for certain, critical, geologic work. An owner or the representative of an owner might well find it an advantage to be able to specify the level of licensing required to perform certain work under a contract he or she administers. It gives the owner a first cut on quality control and delivers a message to the consultant about the importance of the work.

Those of us who spend a lot of time with civil engineers know that many civil engineers prefer specialty recognition for engineering geologists. They want to be able to deal with a geologist who has demonstrated special experience and abilities in the application of geology to civil engineering problems (Galster, 1982; Hartzell, 1990).

Where numerous statutes and regulations require work to be done by a specialty geologist, that specialty should be legally defined and the use of its title restricted. The public benefits from specialty licensure because the work is more likely to be done right the first time, regulatory reviewers can evaluate the reports more efficiently, and the quality of the work is generally higher.

Specialty licensure exists even if it is not so identified, in a de facto way. Some geologists' licensure laws have such broad exemptions for resource or extractive industry geologists that the only geologists left who qualify for licensure are the engineering and environmental geologists, and the hydrogeologists. That seems to be specialty licensure in everything but name.

The scars from this battle have hardened into still currently held strong positions...

Chapter 5

How Are Professional Licensure Laws And Professional Ethics Related—If At All?

Introduction

This chapter explores a fundamental question about the relationship between professional ethics and licensure laws. Do ethical considerations support licensure laws, do they argue against licensure laws, or do they stand aloof from licensure laws?

The word "ethics" (or "ethic") is derived from the Greek words "ethikos" (moral) and "ethos" (character). According to Garner (1981), "Ethics is the branch of philosophy in which we attempt to evaluate and decide upon particular courses of moral action or a general theory of conduct." If a calling wishes to be identified as a profession it usually develops a code of ethics or code of professional conduct (Stover, 1990; Ladd, 1980). Thus, there is a connection between professionalism and ethics, explored in Chapter 6, but are licensure laws ethical?

Ethics And The Public Interest

Generally, three basic characteristics define professional work (see Chapter 2): the work requires extended academic training, it is principally intellectual in nature, and we must apply judgment and exercise discretion in the application of our knowledge. In my opinion, there are two additional characteristics that separate the learned professional from the nonprofessional. First, we take ultimate responsibility for our decisions and actions. By this, I mean that when a designed structure fails (or when the contractor building it encounters "changed conditions") it is the design professionals involved who get sued, not the technicians who drafted the plans, and not the workmen who built it. Second, we professionals are constrained to take the public's interest into account in our work, along with the interests of our employer, our client, and ourselves. Indeed, if a situation arises in which the public interest is counter to the interest of our employer or client, the learned professional should attempt a reconciliation of these interests, and place higher value on the public interest than on the private interest.

Carper (1991) discusses (with reference to engineers, but applicable to geologists) how the "engineer acts both as a rational agent and as a moral agent in the execution of professional responsibilities."

To recognize that one's practice comes under the purview of the public interest is to recognize that one is a professional. To state one is a professional is to state that one's work comes under the purview of the public interest. Through their professional association codes of ethics, many professionals affirm that they practice in the public interest and that they therefore must hold the public health, safety, and welfare paramount in the performance of their professional duties. Several examples of the specific language that professionals have accepted are given in Table 5-1.

Can a licensure law be based on ethics? Can a licensure law recognize ethical principles?

Can a licensure law be based on ethics?

Certainly. In a very basic way, licensure laws are directly tied to ethical principles. The preamble to almost every existing licensure law for geologists uses language very similar to the language found in many professional codes of ethics. Consider the preamble to the Idaho law, and compare its

phrasing to the excerpts from Codes of Ethics in Table 5-1:

> **"In order to safeguard life, health, and property, and to promote the public welfare, the practice of geology in this state is hereby declared to be subject to regulation in the public interest."**

One wonders if the author of the Idaho law preamble might have reviewed several geological association codes of ethics before taking pen in hand to write. Clearly, licensure laws, at their roots, reflect ethical principles. Licensure laws are based on and justified by the same fundamental ethical consideration that appears, in one guise or another, in most professional association codes of ethics or codes of professional behavior.

Licensure laws can have a requirement that the board created thereunder adopt a code of professional conduct (read code of ethics) to which all registrants are subject. The Arkansas licensure law and the Suggested Geologists Practice Act (Council of Professional Geological Organizations, 1993) are examples.

Licensure laws thus provide a far-reaching means by which the ethical standards of a profession can be implemented. Regrettably, relatively few professionals choose to be a member of a professional society that has a code of ethics (see Chapter 3). A licensure law, however, applies to all those who must be registered, regardless of whether they are a member of a professional society that has a code of ethics.

This leads to an interesting proposal. Given that

(1) Licensure laws are justified by and in agreement with the principles of professional ethics, and that,

(2) Licensure laws make considerably more professionals subject to ethical constraints than do professional associations, then,

(3) If a professional association has a Code of Ethics that recognizes the duty of the professional geologist to the public interest and to the public health, safety, and welfare, shouldn't that professional association and its members be promoting strong licensure laws because licensure laws extend their concept of professional ethics to more professionals?

Many geologists who oppose professional licensure do so because "my practice does not affect the public health and safety." Often they will go further and say something like "the practice of petroleum geology [or economic geology or archaeological geology] does not affect the public health, safety, or welfare." Yet many of these geologists are members of professional associations, such as most of those listed in Table 5-1, which have codes of ethics that acknowledge (to varying degrees, but still accepting in principle) that the practice of geology is subject to the public interest and that the geologist, in his or her practice, must hold the public health, safety, and welfare paramount.

It would seem that members of professional associations having a strong code of ethics face a moral dilemma if, on the one hand, they subscribe to the code. of ethics of the organization (and thus affirm their professional duty to the public health, safety, and welfare), and on the other hand (when they want to argue that they should not be subject to professional licensure) they deny that their practice, or the practice of their cohorts, has any impact on the public health, safety, and welfare, or is subject to the public interest. (The concepts of the public welfare and the public interest are covered in Chapters 9 and 10, respectively.)

I should note that the quotation in Table 5-1 from the American Association of Petroleum Geologists is from the 1985 edition of their Code of Ethics (Division of Professional Affairs, American Association of Petroleum Geologists, 1985). The 1990 edition of the code (Division of Professional Affairs, American Association of Petroleum Geologists, 1990) does not make reference

to the public interest, nor to the public health, safety, and welfare.

Conclusions

Professionals accept a high level of responsibility to the public, as well as to their employer or client, in the prosecution of their work. The supremacy of the professional's responsibility to public is generally set forth in professional codes of ethics. Licensure laws are based on and consistent with this ethical concept. Thus, there is indeed a connection or correlation between professional ethics and professional licensure laws.

Licensure laws apply to far more professionals than do professional association codes of ethics. Licensure laws are a means of ensuring that all professionals practicing before the public, and not just those who subscribe to a professional association's codes of ethics, must acknowledge ethical constraints.

Table 5-1. Uses Of The Concepts Of Public Interest, And Public Health, Safety, And Welfare, In Selected Professional Association Codes Of Ethics

In the Code of Ethics, as amended 1981, as published' 1985, in the Directory of Certified Petroleum Geologists:

(a) A member shall protect, to the fullest extent possible, the interest of his employer or client so far as is consistent with the public welfare and his professional obligations and ethics.

(b) A member who finds that his obligations to his employer or client conflict with his professional obligations or ethics should have such objectionable conditions corrected or resign.

In the Code of Ethics of the American Institute of Professional Geologists, Adopted December 11, 1989: Canon 2: Members should uphold the public health, safety, and welfare in the performance of professional services, and avoid even the appearance of impropriety.

Rule 2.1.3: If a Member becomes aware of a decision or action by an employer, client, or colleague which violates any law or regulation, the Member shall advise against such action, and when such violation appears to materially affect the public health, safety, or welfare, shall advise the appropriate public officials responsible for the enforcement of such law or regulation.

Standard 3.2: Members should protect, to the fullest possible extent, the interest of an employer or client so far as is consistent with the public health, safety, and welfare and the Member's legal, professional, and ethical obligations.

Standard 3.5: Members who find that obligations to an employer or client conflict with professional or ethical standards should have such objectionable conditions corrected or resign.

In the Code of Ethics of the American Society of Civil Engineers as a fundamental canon: "...engineers shall hold paramount the safety, health and welfare of the public in the performance of their professional duties."

From the Principles of Ethical Behavior, Association of Engineering Geologists, Adopted 1985: Article I, Responsibility for the Public Health, Safety, and Welfare: Engineering Geologists have a responsibility to promote the public health, safety, and welfare....

Section 1.4: (Engineering Geologists should) practice their profession in a legal and ethical manner, with due regard to the public health, safety, and welfare.

Article II, Section 2.1: (Engineering Geologists should) maintain undivided loyalty with the client or employer, so far as is consistent with their obligations to the public.

From the Code of Ethics of the Society of Exploration Geophysicists (1990):

9. To interest yourself in the public welfare, and to be ready to apply your special knowledge, skill, and training in the public behalf for the use and benefit of mankind.

From the Code of Ethics of the Society of Independent Professional Earth Scientists (Adopted August 31, 1964):

Section 2 (a): Within the framework of professional ethics, personal integrity, and public welfare, members shall protect the interest of their clients to the fullest extent possible. If a conflict exists within this framework, members will immediately terminate their relationship with the client, unless the conflicting conditions are corrected.

Chapter 6

Is Professional Licensure Unethical, Unconstitutional, Or Unprofessional?

Introduction

Some geologists will assert that professional licensure is any or all of (1) unethical, (2) unconstitutional, or (3) unprofessional. The successful existence of professional licensure for many professions, including geology, suggests that these arguments are largely inconsequential.

Let's explore the arguments and find their flaws. We'll find one major surprise along the way. One of these arguments is partly correct!

These are emotional topics. Care is needed when citing the works of economists, lawyers, and their ilk because they often write from the highly opinionated viewpoint of partisan advocates, but we geologists tend to uncritically assume that their work is produced with the same balanced, dispassionate, approach adopted by physical scientists.

Is Professional Licensure Unethical?

The previous chapter discussed the relationship of professional ethics and a licensure law as such. But what is the relationship of ethics (or professional ethics) to the entire concept of and rationale for professional licensure? Fox (1995, and in other works) implies that professional ethics and professional licensure have, or should have, little to do with each other, and that licensure advocates cannot justify using a presumed improvement in professional ethics as justification for a licensure law.

On the other hand, I can recall when I was working with other geologists to develop the Suggested Geologists Practice Act that several petroleum geologists were adamant in their insistence that the model act incorporate a requirement that the Board adopt or develop a Code of Ethics. In the field of engineering licensure, the California State Board of Registration for Professional Engineers and Land Surveyors has apparently found enough of a connection between ethics and licensure that it is seeking (Turner, 1995) "...statutory authority to...develop a code of ethics for engineers in California."

Ethical Theories and Professional Practice

To evaluate an assertion that some condition or action is unethical, we must first understand the framework of ethics. Ethics is the "branch of philosophy in which [we] attempt to evaluate and decide upon particular courses of moral action or general theories of conduct" (Garner, 1981). Because ethics is a branch of philosophy, those who assert that professional licensure is unethical, or completely divorced from ethics, would do well to frame their argument with reference to an accepted ethical theory defined by philosophers. Otherwise, we are dealing only with an unsubstantiated personal declaration, perhaps a sort of Queen of Hearts fiat (Carroll, 1990) that licensure is unethical because the word means "exactly what I want it to mean."

The field of applied ethics, as described by Bedau (1992), would seem to be the specific field relevant to discussion about professional ethics. In terms of general ethical theories, those who assert that professional licensure is unethical would probably base their arguments on either or both of two ethical theories, the Theory of Value or the Theory of Obligation.

Referencing Garner (1981) again, the Theory of Value deals with the nature of "good," and the Theory of Obligation deals with conduct. Theories of Value can be monistic (based on only one thing being intrinsically good) or pluralistic (based on several intrinsically good things). According to Garner, a Theory of Value should answer the question, "What things,...motives, states of affairs, and character traits are good or bad?" Theories of Obligation can be teleological (rightness or wrongness of an action determined solely by its consequences) or deontological, accepting that things such as intentions, motives, rules, and contracts, are relevant in moral assessments. Carper (1991) shows how these ethical concepts are applied in the professional practice of engineering, and I find considerable comparability in geologic practice.

Ethics and Licensure in the Classroom

Ostroff (1986) suggests that it is reasonable and appropriate to measure candidates' understanding of professional ethics as part of a professional licensure test. The university classroom would seem to be an appropriate place for geologists to learn basic ethical theory and learn ethical decision making through role-playing exercises.

Vesilind (1991a) provides an excellent review of ethics and morals in exploring the problem of teaching them at the university level. He notes that, "While ethical theories represent systematic reasoning processes for the analysis of value-laden problems and can therefore be taught, morals are highly personal and cannot be learned in the usual manner." Others who have developed curricula to teach ethics, professional values, and moral decision making in the context of professional practice are, for example, Koehn (1991) and Herkert and Viscomi (1991). In both papers the authors indicate that professional licensure is addressed in their ethics courses, providing a connection between licensure and ethics.

Licensure and Codes of Ethics

A connection between professional ethics and licensure can be found in two ethical codes reproduced in Gorlin (1994), the Code of Ethics and Professional Conduct of the American Institute of Architects (AIA), and the Code of Ethics for Engineers of the National Society of Professional Engineers (NSPE). The AIA code states, under Canon IV, "Members shall comply with registration laws and regulations governing their professional practice." The NSPE code states "Engineers shall conform with state registration laws in the practice of engineering." The Code of Ethics of the American Institute of Professional Geologists (American Institute of Professional Geologists, 1991), while not calling out licensure laws as such, nonetheless, through its Standard 2.1 it suggests adherence to all "applicable laws, codes, and regulations." Rather than stating that professional licensure is ethical, these codes imply that it is ethical because they command conformance to licensure laws as a matter of ethical behavior.

Chalk and others (1980) address professional ethics for scientists and neither they nor their many contributors make any mention of conflict between professional ethics and professional licensure. I am unaware of any geological or other design profession's code of ethics that classifies professional licensure as unethical. A perusal of some of the major codes of ethics found in Gorlin (1994) indicates that none of them contain outright statements to the effect that the association believes that professional licensure is unethical. Goldman (1992) writes briefly on professional ethics and does not raise the issue of licensure.

As noted by Prasuhn (1995), the American Society of Civil Engineers (ASCE) opposed professional licensure from 1897 to 1935. According to Vesilind (1995), ASCE adopted its first Code of Ethics in 1914. In this code, and in all the revisions through the years (detailed by Vesilind, 1995) there is no opposition to professional registration for engineers on an ethical basis, even though for many years ASCE opposed professional registration for engineers on other bases.

Surely, if there were any widespread support for the proposition that professional licensure is unethical, by now many, many professional associations would have said exactly that in their codes of ethics, if not elsewhere. Instead, some professional

associations explicitly recognize the ethical duty of the professional to conform to registration laws, and others implicitly recognize that ethical duty by not taking a contrary stance.

Is Professional Licensure Unconstitutional?

The charge that professional licensure is unconstitutional is generally made with reference to the "free speech" clause of the first amendment of the Constitution of the United States. For example, Groffie (1994) cites the First Amendment, the Fifth Amendment, and offers many ancillary arguments.

Anti-licensure advocates may be surprised to learn that recent case law gives a modicum of support to their views, but not as much support as they want. A close reading of the entire decision discussed below indicates that many of the reasons cited by anti-licensure advocates to explain why professional licensure is unconstitutional have been considered by the courts and found to be unacceptable. Geologists who want to claim that professional licensure is unconstitutional should research applicable case law and present only those arguments that have not already been decided.

A decision on the constitutionality of a title act was rendered by the federal 11th Circuit Court of Appeals, which covers the states of Florida, Georgia, and Alabama. The Abramson decision, (Abramson vs. Gonzalez, No. 90-4099, 11th Cir. 1992), declared that a Florida statute, a title law governing the practice of psychology, was in part unconstitutional because it restricted free commercial speech in violation of the First Amendment. (The entire decision may be found in 949 Federal Reporter, 2d Series, 1992, p. 1567-1584.)

The Abramson decision hinged on the title protection aspect of the Florida law, and does not bring into question the constitutionality of any practice protection licensure law. As noted by Zeitlin and Dorn (1992), "The decision does not invalidate the licensing laws in any state."

The constitutional right of the state to control professional practice was affirmed. Zeitlin and Dorn (1992) noted that the court "ruled that the state had a substantial interest in protecting its citizens from incompetent or unqualified persons." But the court also held [949 F.2d 1567 (11th Cir. 1992)] that "as long as Florida has not restricted the practice of psychology, the state may not prevent the plaintiffs from calling themselves psychologists in their commercial speech.... As long as the plaintiffs do not hold themselves out to be licensed professionals, they are not saying anything untruthful, for they are in fact psychologists and are permitted to practice that profession under current state law" (emphasis in original). Following this ruling, the Florida legislature passed a practice act to control the practice of psychology.

The Abramson decision has implications for states that presently have title protection laws for geology (and other professions), as well as implications for geologists who wish to introduce a licensure act in a state lacking one. In the absence of a strong challenge, existing title protection statutes are likely to be viewed as valid and enforceable, especially in states outside the 11th Circuit Court. To avoid future challenges on a constitutional basis, those who introduce licensure statutes should propose practice laws rather than title laws.

...those who assert that professional licensure is unethical would probably base their arguments on either or both of two ethical theories...

Is Professional Licensure Unprofessional?

To claim that professional licensure is unprofessional is to claim that the term "professional licensure" is an oxymoron.

I've heard the claim that licensure is or should correctly be applied only to physical objects and animals, but not to people. "I'll license my car and my dog, but not myself," for example. Another anti-licensure advocate writes "Register criminals, not geologists." Surely such remarks are either

mere rhetoric or indicate a profound lack of knowledge and understanding about professional licensure and professionalism itself.

Licensure of a profession the practice of which impacts the public health, safety, and welfare is a hallmark that attests to, verifies, and reaffirms the fact of professional status on the part of the practitioners, not a death knell that signals the demise of professional practice. Martin and Schinzinger (1989) note that one proposed criterion for being a "professional engineer" is "Being officially registered and licensed...." Taoka (1989), in discussing the issue of licensure for engineering faculty, notes that "a professor is not considered a true professional until he becomes a registered engineer...." Slayback (later to become president of AIPG) suggests (1988) that "the real struggle, if geology is to survive as an independent profession, is recognition by law that geology is a learned profession, worthy of licensing as P.G.'s...."

A major part of the mission of the National Society of Professional Engineers is to promote, maintain, and defend professional licensure for engineers. The Association of Engineering Geologists (see Smith, 1995) has a policy that promotes professional registration for geologists. The American Institute of Professional Geologists (AIPG) has a policy (American Institute of Professional Geologists, 1993) that will encourage professional licensure if a state AIPG section wishes it. Several AIPG state sections have promoted or are actively promoting professional licensure for geologists. If associations such as these, with strong practice standards, are promoting professional licensure, then surely licensure must be accepted as an integral part of the fabric of professionalism.

The most interesting insight I can offer comes from Prasuhn (1995). It would seem that initial opposition to licensure by professionals and their associations might be typical behavior. According to Prasuhn (1995), the American Society of Civil Engineers opposed registration from 1897, when it was initially proposed, to 1935, even though ASCE adopted a "model law" for registration of civil engineers in 1911. This opposition was on such bases as "ASCE membership, and ASCE membership alone, was adequate to ensure technical competency and safeguard the public" (Prasuhn, 1995).

If it took 38 years for national professional association opposition to licensure to convert to support in the engineering societies, how long will it take the geologists? The first geology licensure statute was Arizona's in 1956. The ball really got rolling with the California Act in 1968. 1956 + 38 = 1994. 1968 + 38 = 2006. On a national level, I think geologists are approaching consensus, but we are not close to the unanimity of the engineers.

Eventually, licensure is regarded as supporting the recognition of the licensed practice as a profession both within the profession and among the public (see Prasuhn, 1995). When that happens, and I think it will among geologists, licensure will follow in nearly all states.

Conclusions

Four considerations weigh heavily against the assertions that professional licensure is unethical, unconstitutional, or unprofessional.

(1) The successful existence of professional licensure for many professions, including geology, suggests that these arguments have not been accepted by the great majority of professionals, ethicists, or courts. Initial opposition to licensure by some professionals and their associations is normal. Geologists' ideas about licensure seem to be going along the same path toward maturity that was taken by our fellow design professionals, the engineers. If that is the case, it won't be long until we have licensure in all or nearly all states.

(2) Arguments on these bases are not made by consumer advocates, economists, sociologists, and their ilk who oppose professional licensure, and these folks are dedicated, sophisticated, and knowledgeable advocates of their anti-licensure viewpoints.

(3) No mainstream professional association with a Code of Ethics has specifically stated in its code that professional licensure is unethical. If honorable and ethical professional associations have not yet recognized the supposed unethical nature of licensure in their Codes of Ethics, but instead place an ethical duty

on the professional to conform to licensure laws, then surely licensure cannot be unethical or unprofessional.

(4) Several typical charges that licensure is not constitutional have been examined by the courts and found wanting (with the exception of title protection for psychologists in the region of the federal 11th Circuit Court of Appeals). Practice protection laws remain constitutional.

Chapter 7

Are Licensure Laws Perfect And Do They Make Licensees Into Perfect Practitioners?

Introduction

A rather odd question, isn't it, stated that way? After all, human beings are not perfect. Anything humans do, make, or craft is likely to be less than perfect in some way or another. Yet this question, turned around and used as an assumption or presupposition, is often encountered when we talk about issues in professional licensure. It is a favorite argument used by geologists opposed to licensure.

In any system of licensing, as with any human-devised system, there are imbalances, imperfections, tradeoffs, and compromises. In other words, a system of licensure is a dynamic system that occasionally does not come up to its highest and best performance potential. To note or define this lack is, in and of itself, not compelling proof that a licensure law is worthless and of no benefit; it is merely to note that the law is typical of almost every other human-devised system.

Merely to observe that certain aspects of a licensure system are difficult management problems or that they involve costs or inconveniences to both society and the profession regulated is not, in and of itself, sufficient cause to say that the whole licensure system should be dismantled (or not proposed). The basic question is on balance, is the good done worth the costs. (Data are cited in the Preface to demonstrate that licensure has a favorable benefit:cost ratio).

The Perfection Argument

Commonly, geologists who take an anti-licensure stance will start their arguments from the unstated assumption that a licensure law is supposed to be perfect, supposed to solve all professional practice problems perfectly, supposed to guarantee perfect professional performance, and supposed to be universally applicable (with utter simplicity) to all practice situations regardless of their complexity. In a phrase, they presume that a licensure law will or should be perfect in all of its aspects and applications. Serious advocates of professional licensure do not maintain that a licensure law is perfect in these ways. Advocates of licensure know that the basic function of a licensure board is to establish the minimum competence level for admission to licensure (see, for example, Torseth, 1987). Note that this basic function addresses only technical competence. It does not address business practice knowledge or moral character.

Shimberg and Roederer (1994) define licensure (licensing) thus: "Licensing is a process by which a government agency grants individuals permission to engage in a specified profession or occupation upon finding that individual applicants have attained the minimal degree of competence required to ensure that the public's health, safety and welfare will be reasonably well protected." Note that this definition does not imply a guarantee of perfection.

What is the source of this assumption of perfection by opponents of licensure? I think it is derived from a mental reaction that is understandable, human, and natural. As I noted in Chapter 1, geologists take pride in their personal and professional integrity and have a well-developed sense of professionalism. I would suggest that some of us tend, perhaps subconsciously, to view the proposal of a licensure law as an assertion that we are not fully professional or are lacking in integrity, and that we need to

have "Big Brother" watching over us. Licensure is viewed as an accusation that we are not perfect, or not perfect enough.

Geologists who feel strongly about their sense of professional ethics also may feel that the proposal of a licensure law is an insult to their sense of ethics. They would respond with a version of the perfection argument thus: "Well, since you are proposing a licensure law that will tell us all how to behave, you must be saying that licensure will cure all the ethical problems that exist in the profession. Now, let me tell you about the unethical behavior of (members of some registered profession) the State of X. Obviously, licensure does not prevent unethical behavior. Therefore, we don't need licensure because it will not prevent unethical behavior." If universal enforceability were a valid reason to not have a law, we would have few laws indeed. Needless to say, the prevention of unethical behavior is not the only reason for the existence of a professional licensure law, and some will argue (see, for example, Fox, 1995) that a licensure law cannot be an agent of ethical applications.

We can understand why some geologists will base their critique of a proposed licensure law on the assumption that licensure is supposed to make practitioners technically, professionally, and ethically perfect. Those so inclined would naturally reason, "When you tell me that I need a licensure law, you are telling me that I am not perfect. Therefore, you must be saying that a licensure law will make me and all geologists perfect, and further, that a licensure law and its administration will be perfect." Then, with their sense of professionalism or ethics insulted, they go off on a search for imperfections in licensure laws and their administration. They think that if they can demonstrate that some licensure bill or act or its administration is imperfect, they will have destroyed the rationale favoring licensure.

The only problem with this is that their efforts are based on an incorrect premise. No serious proponent of licensure says that licensure is perfect or will make us technically or ethically perfect practitioners. So, if a licensure opponent finds imperfections in licensure they really haven't proved that licensure is worthless because they are reacting only to their own incorrect assumption about what constitutes the rationale for licensure.

...this definition does not imply a guarantee of perfection.

Here is an example. Closs, (1990) cited as an example of the uselessness of licensure laws, a case in which a lack of state licensure was ignored by a federal court. The impression I obtain, on reading the letter, is that its writer's opinion was that licensure laws are worthless because they cannot be universally applied; that is, they must be universal (perfect), and if they can't be perfect, then they aren't worth having.

Can a federal court ignore lack of state licensure by an expert witness? Well of course it can, and rightfully so. Merely to give an example of a federal court exercising its privileges with respect to a state licensure law does not provide proof that a state licensure law is completely worthless or insupportable in any way. To berate a licensure law because it does not operate in this particular arena is to accuse the law of not being able to hit a target at which it cannot be aimed!

Here is another example. Winslow (1992) also uses the perfection argument when he says (apparently with sarcastic intent) "As an outstanding example of how licensure protects the public, I mention the Hyatt Regency disaster and the Galloping Gerty Bridge Collapse." He wants licensure to produce perfect performance; such is not its purpose. It is not appropriate to require perfection in the operation of any law. The first purpose of a licensure law is to set minimum standards for entry into practice in responsible charge of the work. Clearly, the setting of minimum standards does not and is not intended to guarantee perfection in the performance of registrants.

Conclusions

The assumption that a licensure law is or should be universal in its application and perfect in its administration, and that it

guarantees perfect performance and perfectly ethical behavior by registrants is a common but incorrect assumption made by many who question the value of, and rationale for, professional licensure for geologists. Licensure laws must face reality and provide reasonable standards that we are expected to meet as imperfect humans in an imperfect world, not ideals of perfection that we should try to meet in a perfect world.

Licensure laws protect the public by establishing minimum qualifications for those who wish to practice a profession (Torseth, 1987). Having met those minimum qualifications, registrants are still human beings carrying a normal residuum of human frailties and imperfections. Rather than requiring us to be perfect or making us perfect, a licensure law recognizes our human imperfections by setting limits on just how imperfect we are allowed to be and still be licensed to practice our profession. Relatively low levels of imperfection are desirable; hence, the need for a law to establish those limits and enforce them.

Chapter 8

Are Proponents Of Professional Licensure For Geologists Really Seeking Nothing More Than Power, Parity, Job Security, Turf, And Status?

Introduction

Many people who question the utility of professional licensure for geologists espouse a view that, in essence, the driving purpose of those who seek professional licensure is merely, and perhaps exclusively, a desire to achieve higher status in society, establish parity with another profession (usually with engineers), protect or define professional "turf," and to get more power, perhaps some monopoly power in the marketing of professional services, or job security. Thoughts along these lines are sometimes expressed by geologists who are sour on the concept of professional licensure. (See, for example, Troxel, 1982; Pierce, 1983; McLeod, 1992.)

This critique is also commonly offered by economists and social scientists, some of who are inclined to criticize anything they deem to be tainted with a desire for economic monopoly (see, for example, Lochhead, 1988; Watanabe 1987; Young 1987; and Shimberg 1982, 1991). On the other side of the issue, some philosophical thinkers recognize that professionals play an important part in our society and that, if they are to do it well, they should be granted some power and privilege (Schoen, 1983).

These accusations are made with an unstated underlying assumption that the mere seeking of status, turf control, or power, or professional parity, is in and of itself reprehensible behavior and is prima fade evidence of nefarious intentions on the part of those accused of seeking status, control, or power. This assumption is untenable. Never, in my experience, do those accusing the "power seekers" of nefarious motives acknowledge that they are making this assumption, and never do they provide a rational basis for this assumption. Neither do they discuss or consider the idea that there might be redeeming virtues underlying the efforts of the power seekers. In argumentative parlance, this is called selective inattention to countervailing arguments. This is an example of partisan debate techniques, not balanced scientific inquiry.

Power

Fox (1995) begs the geologists who favor licensure to admit that power, or the desire to exercise it, is their driving motive, and not the protection of the public. Power and its exercise is an issue in all laws, including licensure laws, of course. I will posit an argument based on the ethical Theory of Value, a deontological argument, and say that what is important about the exercise of power in a licensure law is the ultimate motive of those who exercise it. To say that those who favor licensure laws want the law because it allows them to exercise power tells far less than half the story. Geologists who want licensure do not want it so they can exercise power for their own or their profession's nefarious motives. They have no such motives.

Those who make the accusation that proponents of licensure for geologists are seeking to protect themselves and their profession rather than the public have never amassed a reasonable body of direct evidence that their accusations are true; they provide no "smoking guns." Instead, they rely on highly stretched inference from their own darkly colored view of the

circumstances. Their arguments fall short of having a convincing basis. I am unaware of any published and peer-reviewed case history demonstrating nefarious power-seeking motives on the part of geologists seeking licensure for geologists.

Sometimes an argument can be revealed as baseless by just turning it around. Who could possibly believe an accusation that the geologists (and their professional associations) who oppose licensure and favor private association certification are merely trying to grab control of the profession and increase their own power?

Professional Parity

Anti-licensure advocates will often charge that one of the hidden goals of licensure advocates is to achieve professional parity. After years of experience in promoting licensure nationwide, I am surprised that professional parity is thought to be a hidden goal of licensure advocates, or perhaps a goal not mentioned to legislators, but simultaneously sold to geologists (see, for example, McLeod, 1992). Parity is an open goal, but a secondary one. Legislators are smart enough to figure it out even if it is not mentioned to them. I think licensure advocates should be able to use the necessity of professional parity as a good selling point, so there is no need to keep it hidden. Professional parity is a necessity if geologists are to be accorded proper respect as fellow professionals by engineers, surveyors, architects, and other licensed professionals with whom they work. Licensure is one of the essential identifying characteristics of a design professional.

Job Security And Salary Increases

Those who accuse licensure advocates of attempting to create a monopoly that will guarantee them job security have never paid close attention to unemployment figures among geologists during the downward trends of a business cycle. The most casual notice taken of unemployment among geologists during a recession should demonstrate that this accusation is wrong. We geologists know that our unemployment rate with its wide swings is proof that we do not control the market and cannot control it. The rate at which consulting firms reduce staff and go out of business, reorganize, and merge when recessions hit also strongly suggests that we do not control the market. If we controlled the market, then some of my registered geologist friends would not have gone through personal bankruptcy in the last recession. Those of us who work for public agencies, a major market for professional services, know that competition for the contracts we advertise is always intense.

Salary increases can occur in some work environments when a geologist becomes licensed because licensure is required for promotion into a position of greater responsibility. It is the increased responsibility that directly brings the salary increase; achieving licensure is merely a requirement for holding the position.

Licensure does not decrease competition and does not increase job security. Real-world happenings tell us that. The market is a far, far stronger force than licensure.

Competition And Market Failure

Many of those who oppose professional licensure for geologists are strong believers in the strength and effectiveness of market forces in controlling professional behavior. "The market will drive the incompetent geologist out of business" seems to be their attitude. There is no doubt that market forces do influence our behavior, but can we rely on the market to do the whole job and do it with efficiency? For the market to be efficient, we must assume both (1) widespread technical knowledge on the part of the public, and (2) a high level of concern among the public for the influence of their decisions on third parties.

The market is not perfect. Economists use the term "market failure" to describe this situation. Cox and Foster (1990) describe the types of market failure pertaining to professional licensure. One of these is "asymmetric information on quality," which they describe as "...a failure [in which it is] more difficult for consumers than for sellers to determine the quality of a service offered." Clearly, this is likely to be the case when a lay person retains a professional geologic consultant.

Another type of market failure is controlled by "externalities." This type of market failure could occur if "professionals and consumers do not take into account the effect of their...decisions on `third parties' not directly related to the transaction" (Cox and Foster, 1990). Consulting geologists almost constantly face the problem of externalities. If we design earthquake or landslide removal on an earthwork project, or design a groundwater contamination cleanup project the work impacts more than just the immediate client. It potentially impacts adjacent property owners, passersby, future owners of the property, visitors to the property now and for decades into the future, and possibly those who rely on groundwater that will pass through the property at depth on its way to a municipal well. How many times have we found that the owner doesn't want to care or think about these third parties as much as we professionals believe is appropriate? Licensure of the professional makes the professional the social conscience of the recalcitrant owner. Licensure of the professional makes the reluctant owner pay attention to doing the job right when it comes to protecting the public's interest because licensure encourages the professional to do the job right.

Who Works For Licensure And Why?

Why do members of a profession work for licensure? Because the market is not efficient, because the public lacks sufficient knowledge or impetus (barring a catastrophe) to demand licensure with vigor, and because some members of the profession recognize the need for licensure because they too often encounter examples of poor practice that harms, or could potentially harm, the public. Who better to recognize poor practice than the practitioners? Who better to act on behalf of the public in implementing licensure than the professionals who are ethically bound to protect the public interest by doing so? If professionals who promote licensure are guilty of anything, it is altruism.

Turf And Status

It would be folly to maintain that professional licensure does not confer at least some semblance of status, power, and turf protection on those who are licensed. But these are secondary goals that are worthless unless the primary goal is achieved: protection of the public. There is nothing dishonorable, unethical, or nefarious in the existence of these goals. They are openly acknowledged and can even be called what they are, as in the title of the article by Macmillan and Knight (1992). Licensure does fit in as part of professional recognition, that is the recognition of professionalism. Prasuhn (1995) states "...professional registration fits into the development of a profession and the search for proper recognition as a profession."

Those of us who have been licensed for a couple of decades in a couple of states know from personal experience that the amount of status, power, and turf protection we have is, in fact, pitiful when compared to amount that we have and seek in the fanciful imaginations of those who abhor professional licensure.

human beings are territorial animals...

Well, I would posit that human beings are territorial animals and there is nothing we can do but accept that fact. We all want recognition of our territory. There is nothing inherently bad about wanting such recognition; it is simply a trait developed as our species evolved. And if such recognition rides along on the coattails of a professional licensure act, it is entirely proper as long as it is kept in the right perspective. What is the right perspective? That the only legitimate purpose for professional licensure is to protect the health, safety, and welfare of the public. That any status, power, or turf protection that comes along with professional licensure should be merely incidental to the degree that it benefits the profession regulated, and should work for the benefit of the public on balance.

Can we say anything good about legal recognition of status, power, and turf? If

status, power, and turf are conferred by a licensure act, then by implication their limits are also defined. Isn't it a good idea to have these limits? Isn't there a benefit to our society by having the turf appropriately divided among the professions? Doesn't the public benefit if a real estate appraiser licensure law does not exclude geologists from doing mineral and water rights appraisals? (See Macmillan and Knight, 1992). There will always be overlap of expertise, and areas of common practice can be identified and agreed upon. Beyond this, we are all better off if geologists do geology, surveyors do surveying, and engineers do engineering.

It has been my privilege in recent years to become acquainted with the members of a dozen state boards of licensure for geologists and with representatives assigned professional licensure duties in several professional geological associations. I have observed several annual meetings of the National Association of State Boards of Geology (ASBOG). I have participated in depth in the writing of the Suggested Geologists Practice Act and in the creation, maintenance and grading of the ASBOG national licensure examination for geologists. In short, I have been present in the "corridors of power" when sensitive issues of the rights of the public versus protection of the profession were raised, directly or indirectly. In every case, the matter has been consciously and conscientiously and rapidly decided in favor of the public. And, in every case, the members of the profession and the representatives of the professional associations supported that bias.

Conclusions

For those who insist on seeing selfish and nefarious motives in the actions of proponents of professional licensure for geologists, I must report that my considerable real-world experience has revealed no such motivation, active or passive, direct or indirect. Make whatever inferences you wish from circumstantial evidence. My response is I've been there in those circumstances and there is no justification for painting geologists who favor licensure with selfish or nefarious motives. In my experience, the contrary is true; the behavior of professional geologists involved in promoting and administering licensure laws and examinations has been consistent with the ethical duty of the professional to hold the interest of the public above their own and that of the profession.

Chapter 9

Is "To Protect The Public Welfare" A Valid Justification For The Professional Licensure Of Geologists?

Introduction

This chapter and Chapters 10 and 11 explore the basis for professional licensure. The key phrase usually given to justify professional licensure is "to protect the public health, safety, and welfare." This chapter examines the concept of "the public welfare."

What Are The Salient Features Of A Licensure Law?

Using a definition quoted by Brown (1989) as a starting point, I will define a professional licensure law as a law that defines the practice of a given field of professional activity, establishes minimum standards for its practice, provides procedures for evaluating the qualifications of applicants to practice and for the issuance of licenses to practice, and provides penalties for persons practicing without being licensed and for licensed persons practicing improperly.

The following ideas are generally given as the basis for professional licensure:

(1) Those regulated will offer their professional services to the public, that is, they will offer to "practice before the public," to "engage in the public practice of geology," or to "practice for others." (The meaning of the term "practice before the public" is discussed in Chapter 11.)

(2) The nature of the professional services is such that, if incompetently practiced, the health, property, welfare, or safety of members of the public may be adversely affected to a serious degree. I suggest that the term "public" as used here means not only the direct purchaser of the professional services, but includes as appropriate the purchaser's family members, guests, business associates, customers, heirs, subsequent owners of the property advised upon, innocent bystanders, owners or occupiers of adjacent properties, and governmental units with an interest in the property because of their permitting, taxing, and regulatory, or public safety functions. (The Preface lists additional stakeholders in the work of the geologist.)

(3) The consumers (immediate or ultimate) of the professional services do not, in general, possess the expertise to evaluate in detail the validity of the technical scope of work required. Nor do they possess the expertise to evaluate how well the work was performed. That is to say, there is an element of trust that the consumer has in the work performed by the professional.

(4) Society in general will benefit from the regulation of the profession in the long term. That is, there is a public interest in the practice of the profession. We of course recognize that, as always, there are costs resident in various forms in any system of government regulation.

Preambles And Purviews

Laws have two basic sections: the preamble and the purview. The preamble is "a declaration by the legislature of the reasons for the passage of the statute...." (Nolan and Connolly, 1979). The purview is the main body of the statute. The preamble

of the Idaho law is an example of a geologist licensure statute that uses all the important words concisely:

"In order to safeguard life, health, and property, and to promote the public welfare, the practice of geology in this state is hereby declared to be subject to regulation in the public interest."

"Public," "Welfare," And "Public Welfare"

What does the word "public" mean when used in the phrase "public health, safety, and welfare"? Surely the word "public" cannot be taken only in the collective sense. As noted in item 2, "public" means more than that. There are geologic hazards that affect the health and life safety of the public collectively and individually. Radon and contaminated groundwater can affect the health and life safety of individuals and groups. Landslides and earthquakes can damage property and affect life safety. Expansive soils don't seem to pose much of a direct health or safety threat, but they can cause property damage that can be a considerable threat to the financial health (welfare) of property owners. Land subsidence can be induced by petroleum extraction, groundwater extraction, or mining operations. Its costs to society can be great. And, of course, the independent resource geologist who evaluates resource potential for owners or potential investors can have a direct financial (welfare) impact on members of the public.

What does the word "public" mean...?

Even in the absence of obvious geologic hazards or problems, the geologist who provides geologic foundation information to a design engineer is making determinations and judgments that must be done with professional care and communicated understandably if the engineer's structure is to serve its purpose well and economically throughout its design life. I would think that "public health, safety, and welfare" means exactly what it says in a simple connotation using the word "public" in a collective sense, but it also means the health, safety, and welfare of members of the public, taken in groups or as individuals.

As a practical matter, we must also recognize that the "public" served by the geologist's work is not limited to the immediate client and the immediate time frame. The stakeholders in the geologist's work include other members of the public affected by the owner's proposed structure or action, and the governmental agencies involved. The geologist's report must stand the test of time. For as long as the structure is in use, the public relies on the geologist's work. A very large public with legitimate third-party interest can be impacted by the geologist's work over a long time.

What does "public welfare" mean? The full definition, from Black's Law Dictionary, fifth edition (Nolan and Connolly, 1979), is "The prosperity, well-being, or convenience of the public at large, or of a whole community, as distinguished from the advantage of an individual or limited class. It embraces the primary social interests of safety, order, morals, economic interest, and non-material or political interests. In the development of our civic life, the definition of `public welfare' has also developed until it has been held to bring within its purview regulations for the promotion of economic welfare and public convenience."

The word "welfare" in the phrase "the public health, safety, and welfare" is found in engineering licensure acts (at least in part) because of the importance of engineering economics. The design engineer protects the public welfare in the economic sense by optimizing cost and performance of the completed project in the design process. Does the engineering geologist contribute to the "public welfare" in the economic sense? Does the geologist's contribution help the engineer optimize the economics of the project?

The answer to these questions should be "yes." We all know that it is common for the geologist, during an exploration program, to find and define geologic complications that increase project costs, but at least the engineer now has a better basis for customizing the design to the site. The life

cycle cost of the structure will be more economical for the owners if major geologically related maintenance or rehabilitation expenses are avoided. And, there are instances where the geologist makes cost-saving suggestions based on geologic observations.

So, even though the term "welfare" in "to protect the public health, safety, and welfare" seems a bit nebulous at first glance, it does have a legal meaning that makes sense. Engineering geologists in their practice do affect the public welfare as it is defined by the law dictionary. We do not, as a rule, have the same intense and extensive impact on project economics as engineers do. (Of course, the overall responsibility for the project generally lies with the engineer.) We do have an impact on project economics and the engineer's design choices, and often that impact is not trivial. This is enough for me to conclude that we should leave the word "welfare" in the phrase "to protect the public health, safety, and welfare" when we use it as justification for professional licensure for geologists.

What does "promote the public welfare" not mean? To many anti-licensure geologists, the first image that appears in their mind's eye when you say "public welfare" is an image of those poor souls who subsist on public assistance checks handed out at the county social welfare office. I've even had anti-licensure geologists ask me if the fact that licensure is supposed to promote the public welfare means that all registered geologists have to go down to the county welfare office once a month and donate time handing out the welfare checks! I trust that the previous discussion keeps us on track in this respect.

Occasionally, we see the word "property" substituted for "welfare" in the key phrase, as "to protect the public health, safety, and property." If "property" is substituted for "welfare" it might more clearly allow the inference that it is economic value that the public seeks to have protected. Even governmental agencies that rely on property tax revenue can be said to have an interest in protecting property from geologic hazards. If a geologic hazard devalues a property, then the tax revenue from the property also will go down.

Conclusion

"To protect the public welfare" is a valid goal of licensure for geologists. The phrase properly includes the concept that there are second-generation consumers who benefit from geologic work and who have a third-party interest in geologic work that impacts them.

Chapter 10

Is There A "Public Interest" In The Practice Of Geology?

Introduction

This chapter examines some of the concepts behind that one fundamental reason that justifies professional licensure for geologists: the practice of geology impacts the public health, safety, and welfare, and therefore the public has a right to regulate the practice. This, of course, is the same fundamental reason that justifies public regulation of any profession. "The public interest" is an umbrella term that covers the public health, safety, and welfare, and also goes a little beyond them in its application.

What Types Of Geologic Practice Impact The Public?

The principal theses explored here are these: if members of a profession practice before the public, then their practice is done under the purview of the public interest just because they are professionals and therefore have that duty thrust upon them. (See also Chapter 2.) Ordinary commercial enterprises, in contrast, have no particular obligation to serve the public interest. An additional premise explored here is that licensure of a learned profession is a mechanism by which our society indirectly regulates some commercial interests (the professional's clients) who, unlike the professional, are not beholden to the public interest.

The previous chapter discussed the concept of "to protect the public welfare" as a justification for professional licensure for geologists. The conclusion was because the phrase "public welfare" carries the connotation of "the economic well-being of members of the public" and because engineering geology practice can affect the economic well-being of the client and the public, that "to protect the public welfare" is indeed a justification for professional licensure for engineering geologists.

But how about the petroleum and mining geologists? The argument can be made that extractive industry or resource geologists do not, in general, significantly affect the public health and safety. Is there any reason to think that their professional practice might affect the public welfare or somehow be subject to regulation under the general concept of protecting the public welfare?

Certainly the activities of economic and petroleum geologists have greatly contributed to the advances of the industrial age and to our current high standard of living. Without the fuels, minerals, and rock products produced through the ingenuity and risk-taking of petroleum and economic geologists, we would still be living in log cabins, cooking over wood-burning fireplaces, and reading manuscripts by whale-oil lamps. In a broad sense, then, resource geologists have made significant contributions to the public welfare, and to the public health and safety. Still, the general benefits conferred on us by the resource geologists are not so directly tied to the public health, safety, and welfare as to justify a requirement that they be licensed.

We can, on a case-by-case basis, present instances where general or local practice as to the responsibilities of the petroleum or economic geologist will put that geologist in the position of potentially adversely impacting the public health or welfare. The petroleum geologist who fails to recognize and correctly analyze the importance of subsurface fluid pressures could plan a drilling program that might end in environmental disaster if the well blows out and pollutes a stream with brackish water or petroleum. The mining

geologist who fails to appreciate groundwater pollution potential of a tailings disposal system can impact the public miles away and decades into the future if groundwater resources are polluted by poor geologic planning.

The Public Interest In The Practice Of Geology

There is, I think, another concept behind the phrase "the public welfare." It is "the public interest" and it is the concept that can bring geologists other than engineering geologists into the professional licensure picture. That is, the public interest in the practice of geology can be said to extend beyond the protection of the public health, safety, and (economic) welfare.

I'll again quote applicable parts of definitions from Black's Law Dictionary (Nolan and Connolly, 1979):

> "Public Interest. Something in which the public, the community at large, has some pecuniary interest, or some interest by which their legal rights or liabilities are affected.... Interest shared by citizens generally in the affairs of local, state or national government.... The circumstances which clothe a particular kind of business with a `public interest' as to be subject to regulation, must be such as to create a particularly close relation between the public and those engaged in it and raise implications of an affirmative obligation on their part to be reasonable in dealing with the public.... One does not devote his property or business to a public use, or clothe it with a public interest, merely because he makes commodities for and sells things to the public in common callings such as those of the butcher, baker, tailor, etc."

These definitions, together with the usual definitions of "profession" and "professional" (see Chapter 2) allow a clear inference that professional practice is indeed clothed with such a level of "public interest" as to be subject to regulation.

The preamble of a law declares the existence of a public interest in the matter treated by the purview (main body) of the law, declares that the law is enacted in the interest of the "public welfare." Hence, any law (and by extension, any administrative rule, regulation, or standard springing forth from a law) arises from a public interest or in the interest of promoting the public welfare. Thus, there is a public interest in the practice of geology if a legislative body declares it by passing a law having to do with geology or geologic practice.

Is "the public interest" a valid basis for professional licensure for geologists? If it is, what are the implications for geologic practitioners—how broad are the ranks of those who should be registered? Clearly, if one's professional practice affects the public interest or the public has an interest in it, then one has an affirmative obligation to be reasonable in dealing with the public. Clearly, too, the public has a right to regulate a profession that impacts its interests. Some professional codes of ethics acknowledge both the public interest in the profession and the professional's duty to recognize the public interest by stating that professional practice must be undertaken holding the public welfare supreme (see Chapter 5).

Licensed professionals must accept and acknowledge responsibility for their work. Accepting responsibility by signing or sealing a report or other document is more than a mere formality. In my mind, it implies that the work was done in accordance with applicable standards and that it was done with the public interest (and public welfare, in a broad sense) in mind. The signature or stamp of a registered professional can be viewed as a declaration to the public that its interest has been served in the prosecution of the work. (Given the complexities introduced by the competing needs and goals of various segments of our society, serving the public interest while practicing a profession is hardly ever simple and clear-cut, but we try.)

What are the areas of professional practice that, although required by law, ordinance, or regulation, do not directly affect the public health, safety, property, or economic welfare? What is the public interest in them, and is it enough to require the professional to be registered?

Environmental impact reports (EIR) come to mind as an example of geology practiced in the

Licensed professionals must accept and acknowledge responsibility for their work.

public interest. Sometimes the geology sections deal with the public health and safety, sometimes they are merely innocuous descriptions of site and regional geology presented only as a matter of record. The worst EIR geology sections are those patched together by a nongeologist from a few easy-to-access sources. These sections usually have inappropriate relative emphasis of geologic conditions, factors, and impacts. Sometimes important geologic factors are overlooked or misunderstood. The plain fact is that the nongeologist authors don't know what they don't know, and therefore the wrong decisions can be made because the geology is not done correctly. Is the public interest great enough that all geology sections of EIRs should be written or supervised by registered geologists?

Archaeological geologists sometimes practice as consultants in the preparation of archaeological reports required by law, ordinance, or regulation. The public has an interest in the work, but the work does not directly affect the public health and safety, nor does it affect the public's economic welfare. The public's interest is that archaeological resources should be respected and preserved, and the public relies on the work of the archaeological geologist to help achieve these goals. The land developer's interest is to maximize return by developing the largest possible proportion of the property containing archaeological resources. Is the public interest in the work of the archaeological geologist great enough that the additional degree of assurance provided by licensure is desirable?

What if a petroleum or economic geologist prepares and signs a report or permit application for his or her employer that will be filed as a public document with a regulatory agency? By virtue of the fact that this is a public document required by a public law or regulation, there is an implied public interest in the work, but is the public interest great enough to say that the geologist should be registered? If one cares to cast a broad net, the answer is yes, for the public will, through the regulatory agency's acceptance of the work, rely on the geologist's work, and the public has the right to establish qualifications for professionals on whose work it will rely.

Licensure puts the professional's livelihood at risk if he or she does not take heed of the public interest as professional assignments are pursued. A practice protection licensure law has teeth that are lacking in any other alternative.

Market Failure And The Public Interest

The typical business is not particularly constrained to act in the public interest on the day-to-day consumer interaction level. A clerk in a store is not bound by a duty to the public interest to tell the customer that the sale of one product the clerk is recommending over another will result in a cash bonus or chalk up points toward a trip to Paris for the clerk. The hotel desk clerk who calls a taxi for a guest is not ethically constrained to mention to the guest that the cost of the taxi service is inflated because the hotel demands a commission from the cab company for referring guests to it. Caveat emptor prevails and is accepted; the business of a typical merchant does not qualify as a business that should be practiced in the public interest. It is assumed that market failure in terms of "asymmetric information on quality" does not exist (see Cox and Foster, 1990).

Professional practice differs from ordinary commercial enterprise primarily because the typical consumer cannot evaluate the quality of the professional's services. In contrast to the situation of a clerk in a retail store, a professional must avoid entanglements such as external gratuities and commissions or rights, or make them known to the client. In other words, market failure in terms of "asymmetric information on quality" does exist when we

consider professional services (Cox and Foster, 1990).

Conclusions

The canons of professionalism in essence require the professional to act as a buffer between the public interest and the unrestrained commercial interests of his or her private enterprise client or employer. It is the public interest that demands, by means of professional licensure, that the signatory geologist must recognize his or her duty, as geologist in responsible charge of the work, to take the public interest into consideration in the prosecution of the work. If a land developer pressures his consulting geologist to reduce the impacts of geologic recommendations on the project so more houses can be built, the geologist's sense of responsibility to the public interest should be the starting point for formulating a response.

Professional licensure formalizes and codifies the duty of the professional to the public interest. When the professional carries out this duty, the good effects have a positive impact on the professional's unregulated clients, further serving the public interest.

The public interest in the practice of geology extends beyond those parts of the practice that directly impact the public health, safety, and economic welfare. It includes all geologic practice on which the public relies.

Chapter 11

What Is "The Public Practice Of Geology"?

Introduction

Licensure laws often use phrases like "the public practice of geology" or "to practice geology before the public" or "to practice geology for others." These are critical concepts in defining who must be licensed and who is exempt or engaged in activities for which licensure is not required. In this discussion the three phrases will be considered identical in meaning.

What is the public practice of geology? It is, in its most direct and elementary meaning, to practice or to offer to practice, as a professional geologist in responsible charge of the work, to the public as a professional consultant. But there is more.

Often in licensure laws this definition is broader. Here is my proposed conceptual language for a more complete definition:

"Public practice of geology" shall mean the performance of geological service or work, such as consultation, investigation, evaluation, planning, mapping, and the inspection of geological work or the supervision of such work, in which the performance of the work is related to the public welfare or the safeguarding of life, health, property, and the environment except as specifically exempted by this chapter (see the following section). "Public practice of geology" shall also mean the performance of geological service or work in the nature of consultation, investigation, evaluation, planning, mapping, and inspection of geological work required for or supporting compliance with municipal, county, state or federal law, municipal ordinances, or regulations developed pursuant to law or ordinance. The act of signing or stamping, as geologist or specialty geologist, any document, report, application, permit, receipt, affidavit, or public record certifying, attesting to, or taking responsibility for, geological work required by or supporting compliance with municipal, county, State or federal laws, ordinances, or regulations shall be deemed to be the public practice of geology.

Exemptions And Responsible Charge

Before proceeding, we need two more definitions: what is "in responsible charge of the work" and what is not the public practice of geology? "Responsible charge of the work" is defined in all full-fledged licensure laws. To be "in responsible charge of the work" means to exercise independent control and direction by the use of initiative, skill, and independent judgment of geological work, or the supervision of such work. ("Independent control and direction" is equivalent to "discretion." Both "discretion" and "judgment" are discussed in Chapter 2.) What is not the public practice of geology? In other words, who is exempt from licensure?

First the easy part. Because of federal sovereignty, a state law cannot affect federal employees pursuing their job-related duties. Therefore, United States government employees, acting in the course of their official duties, are exempt from licensure under state laws.

Next, some laws specifically exempt employees of the state when they are acting in the course of their official duties. This exemption is not a necessary one, although it is common. See Chapter 12 for a discussion of its shortcomings.

There is an exemption for subordinate employees. Under this clause, one may work for a company that offers one's services as a geologist to the public and not be registered if one is supervised by a registered geologist or specialty geologist who is in responsible charge of the work.

This is a necessary and important exemption.

Some laws exempt geologists engaged solely in the teaching of geology or in research that does not affect the public health and safety. Bird (1987) presents some interesting arguments favoring licensure for college engineering professors, which would equally apply to many college geology professors.

Finally, we have the "industry exemption." This concept says that a geologist working for a business organization need not be registered if he or she serves solely the needs of his or her employer and the employer does not offer the services of the geologist to the public. While this exemption is common, it is not necessary for the proper and efficient operation of a licensure law.

Examining The Industry Exemption

My proposed definition of the public practice of geology restricts part of the "industry exemption" and also restricts part of the exemption that might be granted to state and local government agency geologists. The remainder of this chapter is devoted to the industry exemption and its relation to the concept of "practice before the public." Chapter 12 explores the rationale for requiring licensure of state and local agency geologists.

Under the industry exemption, a geologist working, say, for an oil or mining company need not be registered to hold the job, provided that the employer does not offer the geologist's professional services directly to the public. This is fine as far as it goes. But suppose that a mining company comes to its geologist and says "We have this quarry closure plan that we have to file by law, and the law requires that it bear the signature of a geologist who will be responsible for the integrity of the geologic aspects of the plan. Please prepare the geologic parts of the plan and sign on the dotted line." In the normal course of events, the geologist need not be registered to hold his or her job because (1) the work does not significantly affect the public health,_ safety, or welfare, or (2) the public will not directly rely on the work of the geologist, or (3) the employer is not offering the geologist's services to the public. In this case, however, it is clear that the public health and safety are affected by his or her geologic work, the public will rely on the work, and the employer is offering the geologist's work to the public (that is, a public agency).

What if an oil company comes to one of its geologists and says "We have this little problem with the waste dump we've been operating in XY Canyon since 1923. It seems that some of the brine and hydrocarbons got away in some permeable beds and might be headed for some municipal water production wells out in the valley. The state's water quality oversight agency wants us to present them with a plan to explore for the contaminants, define the plume, and design remedial measures. You run the geologic aspects of the program and sign off on any reports the state agency wants to be signed by a geologist." In the normal course of his or her job with the oil company the geologist need not be registered because of the industry exemption. In this example, however, the oil company geologist should be registered because the public will rely on the work.

If there is an operative licensure law, the regulatory agencies will probably have requirements that any geologist signing any report submitted to them be registered. After all, the public has an interest in seeing that the laws and regulations are complied with in a responsible professional manner. The public, through a licensure law, can demand that the signature of a registered professional on a public document imply that the professional has borne in mind and protected the public interest and public welfare in the prosecution of the work supported by that signature.

Regulatory agencies, operating in a state with geologist licensure, sometimes receive reports purportedly prepared by professional geologists that do not bear their signatures or stamps as licensed professionals. Instead, the report contains a transmittal letter signed by a "Quality Control Officer" or "Quality Assurance Officer." Even if the "officer" is licensed, (and they almost never are) it is clear from the job title that they have not been in responsible charge of the work and thus

cannot vouch for the report in all salient aspects. Without the signature and stamp of the professional in responsible charge, the regulatory agency has no assurance that the report submitted is the same report the professional wrote. The chain of implied responsibility between the professional who prepared the report and the public that should trust in his or her work is thus broken.

Cutting The Gordian Knot

California, in its "Rules and Regulations of the State Board of Licensure for Geologists and Geophysicists," contained in the California

Administrative Code, Title 16, Chapter 29, takes an interesting approach to the problem of defining the public practice of geology. It might well be considered by others concerned with this knotty issue.

The California regulations simply say that if the public will rely on a geologic representation, or can reasonably be expected to rely on it or be affected by it, then the geologist making that representation must be registered because this is considered to be the practice of geology "for others." Thus, it would generally seem, a geologist working in California industry, regardless of whether the principal business of the employer is geology, must be registered to perform geologic work the results of which will travel outside the company and be made available to the public (that is, the work is not simply internal reports) and if the public will, or can reasonably be expected to, rely on the geologic work.

This definition further broadens the proposed definition of public practice of geology that I gave at the beginning of this chapter. Consider, for example, a geologist employed in industry, and therefore not necessarily registered, who stands up before a homeowners group meeting or planning commission hearing to present geologic facts and analyses in support of his or her employer's proposed housing development or gravel pit. The geologist is making statements on which the public will rely, or can reasonably be expected to rely, and should, in my opinion, be registered to do so.

(Caveat: The entire California regulation sequence is not quoted here, so be sure to read it in its entirety for yourself if any of this discussion might apply to you.)

Chapter 12

Should State And Local Government Geologists Be Licensed?

Introduction

Chapters 10 and 11 explore the issues of what constitutes the public practice of geology, and who had to be licensed because they were practicing before the public. The focus of these two chapters is on geologists employed in private enterprise. Now let's look at the professional geologist who gets the report of the consultant or industry geologist, and whose job it is to review that report for compliance with regulatory agency standards: the public agency reviewing geologist. Because federal government geologists are exempt from state licensure in the course of their official duties, this discussion concerns only geologists who work for state and local government agencies.

What Do Public Agency Geologists Do?

You might view the public agency geologist , as a bureaucrat performing nothing more than the dull duties of comparing reports, permit applications, plans, etc. against a checklist of required statements, signatures, and stamps. If you do think this way, you would say that the public agency geologist need not be licensed because the work is merely ministerial and therefore does not impact the public health, safety, or welfare. Those of us who have worked in the trenches of public agency employment know that almost always there is quite a bit more to public agency work, especially report review work, than this near-sighted view acknowledges. But first, let's look at in-house staff work as performed by the public agency geologist.

you would say that the...work is merely ministerial...

Not all public agency geologists spend all or even part of their time in report review or compliance work. Many geologists are in-house staff consultants who undertake a variety of assignments. Some of these workers develop scopes of work for and administer consulting contracts. In the process of defining the scope of consulting contracts, public agency geologists can and do make critical geologic decisions. In the process of administering consulting contracts, public agency geologists give guidance (and correct misapprehensions, not to mention outright errors, made by consultants) that constitute critical geologic decisions that impact the public health, safety, and welfare. Some public agency geologists do work that is further reviewed at another public agency.

Why Public Agency Geologists Should be Licensed for Responsible In-House Staff Work

In many cases, the public agency staff geologist is doing work for the agency that must meet the same professional standards that should be met if the work were done by an outside consultant. The agency (public) relies on the professional work of its staff geologist, the work is done in the public interest, and the work impacts the public health, safety, or welfare.

If an outside consultant must be licensed to do the work, why not apply the same requirement to the public agency staff

professional? The only argument against licensure for public agency employees doing this type of work is that the governing board or chief executive of the agency has the expertise to evaluate the qualifications of its professional employees and will act in the public interest in so doing, so the agency doesn't need to be hobbled by a requirement that some of its professional employees be licensed.

This argument is specious. Typically, those in control of public agencies (at the board and CEO level) simply and obviously do not have the expertise (or the time or inclination) to evaluate the qualifications of all of the design professionals on their staffs, which might include geologists, architects, engineers, surveyors, sanitarians, and landscape architects, among others. Many public agencies seem to agree that they require licensure of their professional employees for them to occupy positions in which they undertake complex projects with full responsibility for the work, or positions in which they supervise other professional employees. Indeed, one might ask if the work of public agencies is not so important that the agencies should themselves, through professional licensure for their professional employees, be subject to the oversight of another public agency: a licensure board.

Why Public Agency Geologists Should be Licensed for Report Review and Other Regulatory Work

Orr (1992) lists and examines the common types of regulatory controls and the levels of technical review that accompany each. Although report review and regulatory compliance work can, in some cases, amount to mere ministerial checklist reading, in my view the great majority of it should be done by a well-qualified professional because judgment, expertise, initiative, and creativity are necessary. These special characteristics of professionalism are called for in report review because in reviewing the report the reviewer must

(1) Determine if the facts and analyses are sufficient and appropriate to support the conclusions and recommendations of the report.
(2) Determine if the facts were properly gathered and the analyses correctly performed.
(3) Analyze the reasoning in the report and determine if it correctly and conclusively links the facts and analyses with the conclusions and recommendations, taking into consideration alternative explanations and reasoning paths.
(4) Determine if alternative methods of analysis would have been more appropriate or would have led to different conclusions, and determine the impact of those conclusions on the project and its relationship to applicable standards.
(5) Evaluate whether the report meets the intent, as well as the letter, of applicable standards.
(6) Determine if the field and laboratory work were done correctly, properly reported, and are sufficient to support the analyses and conclusions.
(7) Determine if the report appropriately uses all available data or satisfactorily explains why some data were not used.
(8) Evaluate the internal consistency of the report's facts, analyses, conclusions, and recommendations. This might include, for example, evaluating of the impact of data, facts, or concepts presented in one part of the report, but ignored in other parts on the overall validity of the report; and evaluating intersecting cross sections for mutual logic and support.
(9) Determine if deviations from applicable guidelines or other requirements were or are appropriate on the basis of site-specific conditions.
(10) Determine if some items that should have been included in the scope of work were omitted, and the possible effects that including them would have on the analyses and conclusions.
(11) Determine if the owner (or the owner's attorney) has interfered with the overriding [my opinion] duty of the consultant to protect the public health, safety, and welfare by unduly limiting scope of work or exercising undue control over the scope and methods of investigation, analytical procedures,

data used, data presentation, conclusions, or recommendations.

Clearly, there is an important concept operating here. To determine and comment on the validity of the consultant's work, the technical qualifications of the public agency geologist should be substantially similar to those of the consultant whose report is being reviewed. If the public agency report reviewer must be technically qualified, then professional licensure for the public agency report reviewer is a crucial first step in establishing his or her qualifications as equivalent to those possessed by the (licensed) consultant whose reports are being reviewed. The legal qualification (licensure) is the foundation that supports the technical qualifications.

The desirable technical qualifications of the reviewing geologist include, in many cases, the ability to use the consultant's raw data and undertake an independent analysis and reproduction of the consultant's work. For example, in the RCRA Ground-Water Monitoring Technical Enforcement Guidance Document, (United States Environmental Protection Agency, 1986), suggests (p. 28) that the technical reviewer should "be able to verify the accuracy of the owner/operator's presentation and calculations by...constructing a flow net independently from the owner/operator's data...."

Peer Review Aspects of Public Agency Report Review

Serious professional research studies are universally subjected to peer review prior to formal publication to assure that they meet the standards of the science. Generally, consulting studies submitted to public agencies for regulatory review are not subjected to independent (outside) peer review. The public agency report reviewer (often referred to as the regulatory geologist or the regulator) acts as a peer reviewer who protects the public by upholding standards of professional scientific performance in an arena where those standards seem to be under constant attack by tight-fisted clients and their narrow-minded attorneys. Licensure is a very important aspect of establishing the regulatory geologist's peer status. In the process of determining technical sufficiency, the public agency report reviewer determines if a submitted report is "good science." Hoose (1992), addressing the role of the regulatory geologist in reviewing groundwater contamination reports, succinctly lists the salient duties as follows:

"The regulator is responsible for protecting the public interest, which includes both present and future uses of groundwater when dealing with contamination. They must evaluate each report to determine the following factors:

- •Are the data credible?
- Are the data reasonable?
- Does the interpretation account for all of the facts, including information already known?
- Have all reasonable hypotheses been explored?
- Are the interpretations and conclusions adequately supported by the data?"

Others have studied this topic. Stewart and others (1976) delve into the role of the public agency report reviewer and provide examples of the need for the highest professional qualifications by the report reviewer. Hart and Williams (1978) examine the geologic report review process and remark, "In states where geologic licensure is available, the reviewer should be a registered geologist."

A parallel to the duties of regulatory geologists can be found in the duties of "plan-check" engineers in building permit departments. In California, the State Board of Registration for Professional Engineers and Land Surveyors has taken the position that "plan-checking constitutes the practice of engineering" and has proposed "changes in the law [that] will specify that plan-checking must be done by registered engineers" (Fairfield, 1995).

Clearly, report review work is indeed fully professional work that impacts the public health, safety, and welfare.

Licensure Of Professionals Gives The Public Agency Better Employees

Achieving professional licensure is often viewed as signifying a desire for professional

advancement, a willingness to undertake a higher level of responsibility, and a commitment to professional excellence and high, personal work performance standards. Surely these are qualities a government agency should look for and encourage in its employees.

Shouldn't consultants and the public properly expect that the public agency report reviewer meet the same minimal legal qualifications required of the consultant who wrote the report being reviewed? If the answer is yes, it means that the licensure of the report reviewers should be commensurate with the fields of expertise and the level of licensure of the authors of the report.

In some agencies, persons who are not qualified or licensed as geologists are reviewing geologic reports and supervising geologists (Chandler, 1990). A young, unlicensed, government professional could face a career roadblock if his or her supervisor is not licensed because a licensure board may not accept experience gained under the supervision of an unlicensed person (Chandler, .1990; Chapple, 1992). Thus, a public agency that does not require licensure of its supervisory professional employees does a disservice to both itself and to its subordinate employees. By closing off avenues of professional career advancement (licensure) to existing and potential employees, the agency deprives itself of employees who want to advance themselves. By not encouraging or requiring appropriate licensure for its supervisory employees, the agency stifles the career advancement possibilities of its junior employees. In so doing, the agency not only does a disservice to the junior employees, but to itself and to the public it serves.

Not surprisingly, in a survey of civil engineers in government employment (Colley, 1989), the respondents favored this statement: "Professional registration should be required for all substantive governmental positions." This cannot be entirely self-serving. The same survey reported that "registered engineers have a significantly more positive attitude toward their work environments than non-registered engineers."

Conclusions

The work of public agency geologists is indeed substantive once we peer beneath the ministerial gloss that covers it. If a state has a geologist licensure law, then licensure as a geologist should be required of all state and local government agency geologists who perform substantive work. Persons who supervise unlicensed geologists should be licensed as a geologist or, if they supervise the work of engineering geologists, they should be licensed as an engineering geologist or civil engineer.

The Suggested Geologists Practice Act (Council of Professional Geological Organizations, 1993) contains language that requires licensure of state and local government agency employees performing substantive and responsible professional geological work. I hope that the adopting states follow through on this requirement for state and local government geologists to be licensed to perform substantive work; the requirement benefits the state or local agency, its professional employees, and the public they serve

Chapter 13

How Are Valid Licensure Examinations Created?

Introduction

This chapter is the first of a group of six chapters focusing on licensure examinations for geologists. In this chapter, I focus on aspects of basic examination design. The next five chapters discuss item (question/problem) construction and evaluation criteria, scoring methods, and the use of state-specific geology questions on state licensure tests, and grandfathering. Terms with special meaning in the vocabulary of testing are defined in the glossary (Appendix 1).

The construction, administration, and scoring of a licensure examination is a team effort involving (1) the licensure board, (2) the Subject Matter Experts (SMEs) who are the professional experts who help define the relevant areas of professional practice and the relative importance of each area of practice, and who contribute questions and evaluate their difficulty, and (3) the psychometricians, who are the professional psychologists who guide the process.

The licensure board, within limits imposed by its act, sets policy as to the type of examination it wants. The SMEs give their time and expertise to create, maintain, improve, and grade examination items. The psychometricians offer guidance to the board and the SMEs, develop test security and scoring procedures, maintain the item bank and create the exams from it, write the candidate's guide and the proctor's manual, score the examination according to criteria supplied by the SMEs, and provide analytical reports of the performance of the candidates, the SMEs, and the exam itself so that all can benefit.

Geologists who do not like the concept of professional licensure will often attack the examination and the examination process. I hope this and the following five chapters, together with Appendix 2, will help allay their concerns. Well-educated geologists have nothing to fear from a professionally constructed and carefully administered licensure examination. Making sure they get a well constructed and administered exam is the job of not only the licensure boards and their psychometricians, but also of professional geological associations.

Psychometric and Related Literature

Whether you are a member or administrator of a licensure board, an SME, an examination candidate, or someone who wishes to challenge (or improve) an examination, you should be familiar with at least the more current and directly applicable psychometric and related literature cited here. Check with the sources (most listed in Appendix 4) for availability, current pricing, shipping charges, and taxes, before ordering.

A classic early publication is a special issue of American Psychologist, titled "Testing: Concepts, Policy, Practice, and Research" (American Psychological Association, 1981), still in print at this writing. It includes useful background papers such as Green (1981) and Shimberg (1981). Another commonly cited reference is by the American Psychological Association (1985); its guidance has been extended to occupational licensure examinations although it is targeted for educational and psychological testing. This work will probably be available in a revised version soon. The use of computer-based tests is discussed at length in American Psychological Association (1986); this work includes ethical guidelines for test users and developers as well as guidelines for the administration of computer-based tests.

We are fortunate to have work that forms two modern guidelines directly

focused on the development and administration of professional licensure examinations: Gross and Showers (1993), and Schroeder (1993). These authors provide helpful basic guidance in constructing, administrating, and evaluating licensure examinations.

The most extensive occupational licensure guidelines of which I am aware are the Guidelines for Certification Approval of the National Organization for Competency Assurance (NOCA), published as a series of ten separate guidelines from 1980 to 1985. The NOCA guidelines hail from that organization's original focus on medical and related practice, but some guidelines, such as those on cut-off scores, reliability, and validity, are informative for geological licensure purposes. NOCA now offers certification approval for any certifying organization, including both public licensing board and private (professional society) certifiers.

Authors such as Ebel (1979) have published works on educational achievement tests that contain much that is applicable to licensure tests. I have not explored this literature, but it seems to hold promise.

Critics of licensure examinations, not to mention every other aspect of professional licensure, abound, of course. The most erudite I have found is Shimberg (1981, 1982).

What Should A Licensure Examination Test?

Knowledge

Licensure exams should test knowledge of pertinent facts, concepts, hypotheses, theories, problem-solving ability, and reasoning ability (through problem-solving items), all in the relevant profession, of course. All of these areas should be keyed to the professional tasks related to the protection of the public, and the underlying knowledge, skills, and abilities needed to perform those tasks. Knowledge of applicable laws, codes, and regulations should also be tested, as should knowledge of what constitutes appropriate professional practice conventions.

Candidates

Licensure tests are generally designed to be taken by fairly young professionals who have enough experience to be ready to undertake independent responsibility for their own professional work and the work of subordinates. As a practical matter, licensure tests must focus on this population. This focus of licensure tests creates problems for the experienced professional who must take one of these exams: he or she has to go back to basics, something often believed to be inappropriate. Even the modestly experienced geologist may have to review the basics for success on a licensure examination (Williams, 1993).

Minimum Competency

Finally, the licensure test should be designed to separate those professionals who have at least the minimum competency needed to practice independently and before the public from those who do not have the minimum competency. Minimum competency with respect to civil engineering is defined by the National Council of Examiners in Engineering and Surveying as "the lowest level of knowledge at which a person can practice professional engineering in such a manner that will safeguard life, health, and property and promote public welfare" (National Council of Examiners in Engineering and Surveying, 1991, quoted in Everett and Mitroka, 1993). The same definition could be applied to a geology licensure examination by substituting the word "geology" for "engineering."

A more extensive definition of minimum competency, targeted for geologic practice, was developed by a steering committee and reported in Donnoe and others (1992):

"A minimally competent candidate for licensure as a registered geologist shall possess the knowledge, skill and ability to accurately recognize, characterize, interpret and assess geologic conditions, resources and hazards as they relate to the health, safety and welfare of the public. This includes independently collecting relevant geologic data; understanding geologic literature and reports and maps prepared by others; analyzing data to produce an accurate understanding of geologic

conditions; and accurately and effectively communicating their results, conclusions and recommendations to peers and the public."

What Should A Licensure Exam Not Test?

The purpose of professional licensure is to protect the public health, safety, and welfare. Thus, a licensure test should test knowledge, skills, and abilities needed to protect the public, but should not test knowledge or traits that might be helpful to job success, but which are not relevant to protecting the public. Neither should a licensure examination test knowledge or skills that might be useful in completing an academic curriculum, but which cannot be confidently related to direct or underlying knowledge needed to practice before the public as profiled by tasks in the job task analysis (defined in following paragraphs).

How Are Valid Licensure Tests Designed?

Subject Matter Areas

A valid licensure test starts with research into what it is that modestly experienced (recently licensed) practitioners in the field actually do. The end product is called a job analysis or job task analysis.

A job task analysis usually starts with the compilation of a large list of tasks that professionals might perform. Usually this is done by a panel of SMEs. Next, using this task list, a statistically representative sample of the profession is polled. The development of the job task analysis emphasizes securing responses from recently licensed practitioners so the test can be based on their level of practice. Responses from practitioners with decades of experience are also useful because they provide a perspective based on hard lessons learned over the years.

Psychometricians generally phrase the three primary questions along these lines:

- What is the amount of time you spend performing this task?
- Regardless of time spent, in your opinion what is the importance of each task in protecting the welfare of your client or the public?
- How important is it that a professional geologist be competent to perform this task when initially licensed?

Usually the answers are semiquantitative ranges, such as not important, somewhat important, very important, and essential.

The job task analysis questionnaire lists many typical tasks, but some of the tasks represent aspects of professional practice that have little or no impact the public health, safety, or welfare. The remainder of the tasks have varying degrees of impact. The importance of each task with respect to its impact on the public health, safety, or welfare is weighted by the opinions offered by those polled. A panel of SMEs may decide on a cut-off point in the task ranking of the polled population. Below this level of importance, no questions will be asked. These and other weightings control the number of questions on each task and task group on the examination. Every test candidate thus faces an examination that represents a homogenized average mix of job tasks, knowledge, and skills; therefore, very few candidates walk out of an examination feeling that it represents reality as they experience it in their current personal practice.

A list of topics (tasks) with their weightings is often called the test blueprint, plan, or outline, and is also referred to as the examination specification or description. Although some boards jealously guard their test blueprints, in my opinion they should be made available to candidates, at least in summary form. Examples of a test blueprint made available to candidates are found in Educational Testing Service (1993), and in National Association of State Boards of Geology (1994).

Test Format—General Aspects

A licensure test may conceivably consist of any one of the following item types or any mixture of them: (1) the constructed-response or free-response group of item types consisting of essay, short answer, fill-in-the-blanks, and show your-work graphical or mathematical problems;

(2) multiple choice and its variant, true/false, and (3) practical. Although it is not unheard of for a geology licensure examination to have a practical or performance component which tests the candidate's ability to, say, identify a group of rock samples, it is rare. (At this writing, Oregon, North Carolina, and Idaho reportedly have a practical component to their examinations.)

Some examinations allow the candidate a choice of items from one or more groups of items ("Solve one problem only from problem set 1 and two problems only from problem set 2," for example). This reduces the validity of the overall examination, as described by psychometrician Jack L. Warner (written communication): "If candidates are allowed to pick which items they answer, those possessing good test-taking skills have a clear advantage...." And, "In my opinion, candidates should be required to answer all items in an examination. Candidate scores are more accurate because the same measure is used for ill, candidates" (emphasis in original).

Interesting arguments can be made for using styles such as essay, short written answer, or show-all-your-work problems for at least some parts of a test; however, if the population to be tested is large, practicality rules in favor of the multiple choice test, which can be made machine scorable. The scoring can then be done quickly and objectively. Another advantage of multiple-choice tests is that the candidates can be given fairly specific feedback on their individual performance on general topic areas (see, for example, Educational Testing Service, 1993).

An essay or show-all-your-work problem is time consuming to grade. The grading, despite the standard of care generally exercised, is open to some amount of subjectivity and, therefore, challenge by the candidates. A machine-scorable test allows statistical analyses to be made. These have value in identifying nonvalid items, which leads to continuous improvement of the test over time. In concept, it is possible to write multiple-choice items (questions or problems) that will draw on the knowledge and reasoning powers of the candidate as deeply as essay or short written answer tests.

Many geologists involved with licensure exams are reluctant to accept the validity of a pure multiple-choice examination, even if it has elements of constructed-response problems included in it. We can make a structural geology problem, such as the projection of a bed across a topographic map, into a multiple-choice problem by giving the candidate choices such as "...bed A if projected will pass through points L, M, and N; or P, Q, and R, etc.," where these points are located on a map. We can create a problem in which the candidate must construct a flow net and then select from a list of four options one number derived from use of the constructed flow net. The objection to this procedure is that the candidate knows that one of the options must be the right answer, and therefore, with the right answer in front of him or her, the candidate is free to guess.

Many geologists... are reluctant to accept the validity of a pure multiple-choice examination...

The issue of guessing and bluffing is explored in detail in the next chapter, as is the issue of equivalency of free-response and multiple-choice questions.

Chapter 14

What Question Formats Should Be Used On A Geology Licensure Examination?

Introduction

Geology licensure examinations generally use one or more of the following formats of questions or problems: multiple choice, constructed response (often called free response), or performance. I won't address performance or practical problems because very few states use this type of questions.

What are the advantages and disadvantages of multiple-choice and constructed-response items in a geology licensure examination? Can multiple-choice and constructed-response formats be made equivalent in all essential aspects at a practical level of effort? Is it possible to determine the equivalency of two examinations, one all multiple choice, and the other partly multiple choice and partly constructed response? The answers to these questions are important because they bear on reciprocity issues.

This chapter is based mostly on personal experience. I have been an SME (subject matter expert) for the ASBOG examination since 1991, and a grader of constructed-response questions on the California licensure examinations since 1988. Because of my networking with licensure board members, graders, and administrators, I have knowledge of the general nature of geology licensure examinations nationwide.

Multiple-choice items are easy to adapt to a machine-scorable test. Some types of free-response items are difficult or impossible to incorporate in a machine-scorable test. One big disadvantage of free-response problems is that they are difficult and time consuming to grade. The logistics of handling, distributing, controlling, reassembling, and totaling scores on an exam with a large free-response content can be daunting to a board and its staff and graders. Candidates can wait too long for their scores, and challenges to the grading are a burden on both the candidate and the board.

Multiple-Choice And Constructed-Response Items

Multiple-choice questions can be written at several levels of sophistication. Recall questions merely require the recall of facts or concepts and choosing the fact or concept that meets the criteria given in the stem of the problem. Cognitive questions require not only that the person recall facts or concepts, but he or she must use that knowledge with supplemental knowledge, problem-solving skills, and judgment to determine which option is the correct answer. Some cognitive problems require independently choosing the correct equation or equations and analyzing a data set with those equations to determine an answer. Other problems might require an independent geometric or graphical construction for their solutions. Cognitive questions might be situational, establishing a situation and requiring analysis of it.

Multiple-choice questions can be written at several levels of sophistication.

What is a constructed-response or free-response question? We often encounter them as essay, short-answer, or fill-in-the-blank questions, or problems to be conceptualized and solved mathematically

or geometrically. Except for their simplest forms, constructed-response items are cognitive. Werner (1993) says "...constructed-response items challenge the test taker to construct an acceptable answer rather than just to recognize one." Implied in this remark is one of the chief criticisms of multiple-choice items: the concept that they are somehow easier, and more prone to being answered correctly on the basis of guesswork than are constructed-response items. That is the principal issue explored here.

Werner (1993) provides some advice on when to use each format. "If your objective is to assess mastery of factual information, use multiple-choice items. If you want to test candidates on their ability to organize and relate ideas, compare and contrast methods, explain things clearly, or create complex solutions, consider constructed-response items." Although this statement points out some of the (theoretical) advantages of constructed-response items, Werner (1993) also provides some additional commentary, paraphrased here, on the utility of constructed-response items:

- They have considerable face validity, independent of whether they are more or less valid in other respects than multiple-choice tests
- Although they eliminate guessing, constructed-response items are open to bluffing
- Because of the response time required, constructed-response questions reduce the ability of a test to cover a broad range of subjects
- Reliability might be lower than for multiple-choice tests
- They are no easier to develop than multiple-choice questions
- They are difficult to score with reliability and validity
- They have a short life because candidates can easily remember the questions and the answers they gave

Certainly the higher order thinking required in answering typical constructed-response items should be tested in a geology licensure examination. I believe that we can do an acceptable job of this by the use of carefully crafted multiple-choice items.

In my experience with constructed-response problems, nearly all of them are mathematical (including geometrical) and meet only the "create complex solutions" testing goal of Werner (1993). Essay-type responses are seldom requested in geology licensure examinations, but these are the responses that would meet the other testing goals for constructed-response problems listed by Werner (1993). The present, somewhat limited, use of constructed-response items on geology licensure examinations does not take full advantage of their inherent potential as an examination item.

An essay response might, on the surface, be well suited to testing a candidate's ability to write a good report, which is what the candidate will have to do as a licensed geologist serving clients. Yet, on a practical basis, we must ask how the grader would approach a stack of 200 2- to 5-page handwritten essays on a technical topic. How would organization and logical development be scored objectively? In a closed-book examination, what about references and how they are cited? How long would the stem be to adequately set the stage so the candidate's responses are properly guided? I don't see the graders in a position to do much else than scan the essays for a few key concepts, ideas, and phrases, giving scant credit or consideration to organization and logic, which would be the reason to have essay questions in the first place.

Comparing Examinations Based On Different Problem Formats

Can a multiple-choice question be a constructed-response problem in essence? I think so. Many of the multiple-choice structural, economic, map interpretation, and groundwater problems on geology tests are basically constructed-response items in terms of the depth of knowledge, skills, and abilities needed to solve them. What keeps them from being called constructed-response items is the fact that multiple-choice options are given to the candidate. The options will include the correct answer and (typically) three or four distracters. Ebel (1979, his chapter 8) presents a thorough analysis of the multiple-choice

item format and demonstrates with examples that carefully crafted multiple-choice items can do the same job as constructed-response items.

Psychometrician Jack L. Warner related to me (personal communication) the case of a land surveyor's exam in an eastern state that for many years had a major constructed-response problem: the writing of deed description. The ability to do this accurately is certainly an important part of land surveying practice. As it happens, one well-qualified SME created and graded this problem for many years, acquiring great familiarity with all aspects of candidate performance. Through experimentation with problem format, from pure essay to fill-in-the-blanks to multiple choice, it was shown that correlation and validity did not suffer by abandoning the constructed-response format and changing to the multiple-choice format.

Correlating between two examinations, one a mix of multiple choice and constructed response, and the other entirely multiple choice, might seem to be impossible. In the long run, of course, a good compliance program will tell. If a board that uses free-response problems finds that its enforcement workload is or is not significantly increased when it grants reciprocity to out-of-state geologists who have only passed the purely multiple-choice exam, it will have an index on exam equivalency. All the board has to do is keep records and do a simple analysis.

Another approach would be to monitor the performance of geologists who have passed a purely multiple-choice examination when they are required to take a constructed-response examination. A very high pass rate would suggest exam equivalency. Again, simple recordkeeping and simple analysis are all that are needed. Some support for this concept is provided by Thomas M. Stout (written communication) who notes "NCEES psychometricians have said repeatedly that KSAs can be tested equally well by either type of question. One kind of evidence cited to support this view is studies showing that people who do well on one type of question do well on the other, and similarly people who do poorly on one type do poorly on the other."

Discussion: Constructed Response Vs. Multiple Choice

The Philosophical Issue

The big philosophical issue is that boards and exam writers who favor constructed-response items do so on the basis of their conviction that licensed geologists should be able to demonstrate that they can derive the correct answer given a set of facts, a challenge, and a blank piece of paper; not given a set of facts, a challenge, a blank piece of paper, and four or five answers, one of which must be correct. In other words, they are uncomfortable with the possibility that the applicant can guess the correct answer. They believe that the evaluation of several partly or wholly worked-out problems by a grader is critical to the granting of a license. They think that the challenge of providing an answer without a set of options simulates the real world of geological practice; however, geologists are trained to use the doctrine of multiple working hypotheses championed by Chamberlin (1890, 1897) and therefore very quickly come up with a list of multiple-choice approaches to solving the problem; these lead in essence to candidate-generated multiple-choice answers.

Ebel (1979) states that the guessing done by candidates on multiple-choice problems is actually a process of elimination. If this process of elimination uses appropriate knowledge and thinking, then why should it not be accepted by the test writers and graders? As Ebel (1979) points out, "...the knowledge and ability used to eliminate incorrect alternatives can be, and usually is, related to the knowledge or ability that would be required to select the correct alternative." Perhaps we should view the use of the process of elimination by candidates as a simple, first-level, application of professional judgment [as defined by Fish (1950)] be happy that our multiple-choice examination can measure professional judgment at this elementary level.

The multiple-choice exam might be more difficult than the constructed-response exam in this way: with multiple-choice,

regardless of whether you guess, you either get the correct answer or you don't, and you have a 20 or 25% chance of getting the right answer if you guess blindly. With constructed-response problems, the candidate has an opportunity missing in multiple-choice exams: he or she can get partial credit, even for well-presented guesswork [the "bluffing" of Werner (1993)] that does not go far enough to prove they can derive the correct answer. The partial credit for this constructed-response guesswork/bluffing can easily be more than the 20 to 25% the candidate can get by guessing blindly on a multiple-choice problem.

It seems to me that if the ability to derive the correct answer given a set of facts and a blank sheet of paper is really all that important, then no partial credit should be given for constructed-response problems. After all, what client wants to hire a consultant who can only carry the work to 70% completion?

Partial credit is given, and in so doing the grading plan imposes anew the concept of "minimum competence" on each problem individually. The grading plan (key) may state or imply that an incomplete or incorrect response that is nonetheless minimally competent shall receive some particular score, usually in the range of 60% to 70% of the total points for the problem.

Because the grading of free-response items is subjective there should be close quality control on the work of the graders. For example, in one engineering exam that is entirely free response, "...each paper is scored twice; if the results differ, a third time by a `master scorer' whose responsibility is then to get the others to a common result...differences occur on maybe 40 percent of the problems (Thomas M. Stout, written communication).

The Grader's Dilemma

An additional disadvantage of the constructed-response problem is that some of them are designed as multipart, with an answer from one part cascading as input into one or more subsequent parts, and perhaps answers derived from those subsequent parts cascading yet again into another subsequent part. (I call this a cascading answer problem.) A mistake by the candidate in an early part of the problem can wreak havoc not only in the numerical answers derived in subsequent parts (first-generation havoc wreaking), but also in interpreting the answers of the subsequent parts, as is sometimes required (second generation havoc wreaking).

The quandary the grader faces is this: if an error is made in an early part of the multipart problem, and then the error is carried into a subsequent parts, but the work that incorporates the error is done correctly, should full credit be given for correct work using erroneous input data?

This in itself invites a further partition: if the answer derived by using erroneous input data is of such character that it should be obviously wrong to the minimally qualified candidate, and Candidate A fails to recognize this, should the candidate receive any credit? How do we grade this part of the problem for Candidate A versus Candidate B, who made a small error in an early part of the problem, so his or her wrong answer to the subsequent part is not of such value that it should be obviously wrong to the minimally competent candidate?

Suppose candidates can choose to do one problem from a pair of constructed-response problems, one being straightforward and the other a cascading-answer problem. Those who choose the problem without cascading answers are (consciously or unconsciously) choosing a problem that is (very likely) inherently less risky to them as a candidate. Psychometrician Jack L. Warner (written communication) notes that "`Cascading answer' problems...contain a number of inherent problems and should be avoided if at all possible. If items are constructed in a manner to be clearly independent of one another, corresponding test scores should contain less measurement error."

Conclusions

Constructed-response problems as used on geology licensure examinations do not take full advantage of the breadth of the genre. Mathematical problems greatly predominate over essay and related styles.

Using constructed-response problems instead of multiple-choice problems simply does not eliminate guesswork or, as noted by Werner (1993), bluffing. If partial or full credit is allowed for answers to constructed-response problems, then the use of constructed-response problems does not eliminate credit for guesswork. In this respect, they are no more rigorous than multiple-choice problems, and may be less rigorous.

Logistical and practical difficulties in the use of constructed-response problems are many. Carefully crafted multiple-choice items can substitute for constructed-response problems.

A possible accommodation to those who dislike the idea of putting the right answer in front of the candidate as one of several multiple-choice options is to use a gridded response answer sheet on which the candidate fills in the "bubbles" representing the numerical or alpha-numerical value of their answer. For some problems, it might be necessary to accept a range of values corresponding to a grader exercising judgment in a hand-grading situation. The gridded-response also limits the type of constructed-response problem that can be used to essentially mathematical or graphical problems. Nonetheless, it also makes the examination machine-scorable, which has many benefits.

Chapter 15

What Are The Guidelines For Writing And Evaluating Multiple-Choice Licensure Examination Items?

Introduction

This chapter presents a set of guidelines for writing and evaluating multiple-choice examination items. With these guidelines in hand, you will have a solid basis on which to write or evaluate test items if you wish. If you are not familiar with the testing vocabulary, part A of Table 15-1 will bring you up to speed. Go ahead and give it a try after reading the guidelines; sit down and write a few exam questions. Make sure you followed all the suggestions in Table 15-1, then evaluate your work using the criteria in Table 15-2.

Item-Writing Guidelines

The guidelines are modified slightly from those presented in ASBOG (National Association of State Boards of Geology) examination writing and grading sessions (Jack L. Warner, personal communication). Although the guidelines presented here are informal, they are generally comparable to a similar set of suggestions published by Schroeder (1993).

The guidelines are listed in Tables 15-1 and 15-2. Table 15-1 lists suggestions for constructing multiple-choice examination items, and Table 15-2 lists suggestions for evaluating items. The guidelines indicate that some types of multiple-choice items are generally not looked upon with favor. Let's explore some of the reasoning behind that thinking.

A good licensure test will avoid, as much as is practical, items that challenge test-taking skills rather than the knowledge, skills, and abilities needed to practice the profession; and items phrased in unsupportable absolute terms. Here are some item types that fall under those cautions.

(1) Type "K" multiple choice questions, in which the options include choices such as "A, B, and E" or "all except C and D."
(2) True/false items. True and false are absolutes and thus subject to challenge on the basis of demonstrable, if far-fetched, exceptions. With true/false items, there are only two options and this limited number does not provide the discrimination preferred by psychometricians.
(3) Interrelated multiple-choice questions, which allow the candidate to play two or more questions and their options against each other to determine what the likely correct answers are without specific knowledge of the correct answers.
(4) Option lists that include "all of the above" or "none of the above."
(5) Trivia.

Of these five undesirable item types, it is possible to avoid types 1 and 2 as a matter of policy. Type 3 can be avoided if the item pool is large and the item selection method is sophisticated.

With respect to type 4, item writers tend to make the "all of the above" option the key nearly every time, and make "none of the above" a distracter nearly every time. Good test-takers can sense when this is the case. In effect, this reduces the question almost to the level of a true/false item; its discriminatory power is low. Schroeder (1993) suggests that "all of the above" be used sparingly and that it should not be

correct every time it is used, and that "none of the above," if used, should be the correct response for at least some of the items.

I think there is room for a few "all/none of the above" options on another basis. There are some knowledge areas that might best be presented with an option list that concludes with either "all of the above" or "none of the above." We geologists are often faced with practice situations in which we are required to recognize and evaluate several factors that at first glance appear to have equal or subequal importance. We know that any one factor (or all or none of them) might be raising a red flag. These situations can be presented as questions to which the correct answer might be "all of the above," "none of the above," or a specific, noninclusive, option.

Whether a question tests trivia (type 5) can sometimes be difficult to assess. One of the fascinating challenges in geological problem solving is finding that elusive and remote detail that controls, by inductive thinking, a chain of logic leading to a significant conclusion. In this sense, what is a piece of trivia to one geologist can be the key to success for another.

Still, I think that the label "trivia" can be justifiably applied to test items that have no clear-cut relationship, even one level removed, to the direct or underlying knowledge needed for daily practice before the public at the entry level. Questions such as, "In North America, the Carboniferous of Europe is divided into the _____ and the _____ ," probably represent trivia, at least from the standpoint of their suitability as licensure examination items.

A now-discarded test question used by one of the western states in the 1970s was regarded by many candidates who encountered it as the utmost in trivia. Candidates still complain about it 20 years later. The question reportedly took the general form of listing several "famous geologists" from early times forward (e.g., Grabau, Werner, Linnaeus, Lyell, Agricola, Dana, Darcy, Murchison, Smith) and said "pick x number of these geologists and describe their contributions to geology."

Table 15-1. Suggested Guidelines For Constructing Items

A. Definitions
- An item is a question, incomplete statement to be completed, or a problem to be solved.
- The introductory part of the question or incomplete statement is called the stem.
- In a multiple-choice item, the possible answers listed are called options.
- The correct answer is the key.
- The incorrect answers are called distracters.

B. Suggested Guidelines (General)
- Each item should have only one correct or best answer.
- Use simple wording.
- Keep the overall purpose of the item clearly in mind.
- Avoid trick items and trivial items.
- Write at an entry level (that is, entry into the profession at the level of being in responsible charge of the work).
- Items should be clearly related to practice situations and to the direct or underlying knowledge needed to practice in a way that affects the public health, safety, and welfare.

- For multiple choice questions, there should be at least four options.
- Do not use wording or illustrations directly from copyrighted material. *Provide a reference that substantiates your item whenever possible.

C. Suggestions For The Stem

- Adequately describe the problem or the situation.
- The stem should contain as much of the item as possible.
- Include in the stem any words that would otherwise have to be repeated in each option.
- Avoid negatively worded stems if possible. If you use "not," underline and capitalize it for clarity. (Examinees tend to overlook "not" in the stem.)

D. Suggestions For Writing Options

- Place the options at the end of the stem, not in the middle.
- Each option should be grammatically consistent with the stem.
- Make all options plausible to the candidate who otherwise lacks the knowledge to determine the correct answer. No option should be a giveaway, obviously incorrect to even an unqualified candidate.
- Avoid, where possible, the options "none of the above" and "all of the above." Also avoid options such as "all except b and d" and "b, c, and d."
- Avoid making the correct answer substantially longer or shorter than the distracters. (Having two options of one subequal length and two of another subequal length is acceptable.)
- Avoid words such as "all," "never," "always," "every," and "only." [Absolutes are (almost) never true.]
- Options should be independent and mutually exclusive. Do not use one option that generically includes another, more specific, option. If the answer is a range of numbers, the ranges must be mutually exclusive.
- Common misconceptions and errors make good distracters. Also good distracters are options not relevant to the current situation, but plausible to the unqualified candidate.
- Use distracters that might commonly be arrived at by typical mistakes in calculation, but use care that these are not trick questions.
- Avoid double negatives, which a "not" in the stem and a "not" in one or more options.

Table 15-2. Suggested Criteria For Evaluation Of Items

(1) Does the item have only one correct or best answer? '2) Is the item related to the practice of the profession?
(2) Does the item relate to protection of the public?
(3) Is the language clear and direct?
(4) Is the item written at an entry level degree of difficulty?
(5) Does the stem adequately describe the problem or situation?
(6) Is the item free of "trickery"?
(7) Does the item avoid assessing trivia?
(8) Professional Licensure

Chapter 16

How Should The Passing Score Be Set For A Licensure Examination?

What Is The Function Of A Passing Score?

The passing score or cut-off score of a licensure examination should define the minimum level of competence needed in the context of licensure. This level of competence should be established by the responsible boards, relying on the knowledge of Subject Matter Experts (SMEs) who can decide what is the appropriate level of expertise (minimum level of competence) needed at the time of initial licensure. (Definitions of "minimum competency" and other testing terms are given in Appendix 1).

Three Methods To Establish A Passing Score

One of three prevalent methods is generally used to set the passing score for a licensure examination. A passing score can be (1) fixed (for example, 70% of the possible points); (2) established statistically (the passing score is, say, the mean score of all first-time examinees, minus one standard deviation), or (3) set by reference to criteria established by SMEs. The last two methods are unlikely to yield a passing score of exactly 70%, but the raw scores produced by these methods can be multiplied by a factor such that the adjusted passing score may be scaled to the familiar 70 if we wish.

Here are the details on the three methods of setting a passing score.

Fixed Percentage

This method is so common we think of it as valid. It seems very natural because of its prevalence. We are all quite accustomed to this fixed percentage type of exam scoring. We took hundreds of tests and quizzes graded this way in school. We can all recall recognizing the essential unfairness of this method. A teacher could by design or inadvertence give a hard test and flunk most of the students or give an easy test and make all the students appear to be brilliant.

Still, the fixed percentage criterion is used by many licensing boards, usually because it was carelessly included in their authorizing legislation. Why was it included in the law? Because it gives an authoritative aura of accurate standard setting, and it is familiar and therefore presumed correct (even though it is out of context with the purpose of a licensure exam). The main drawback is that the proportion of candidates passing is highly dependent on the difficulty of the examination. The fixed percentage point is essentially arbitrary and capricious unless the exam is conscientiously constructed to take overall difficulty into account. Unfortunately, this is seldom done, and as a result the standard of minimum competency varies from time to time and exam to exam.

Norm Referenced

This is "grading on the curve," or some variation on that theme. The main disadvantage of this method is that it causes candidates to compete against other candidates, not against a standard of minimum competency established by Subject Matter Experts in the profession. Use of the norm-referenced scoring procedure essentially means that the standard of minimum competency changes with every administration of the test because the proportion of candidates passing depends on the brightness of the candidate population and the difficulty of the test. In effect, this method allows the standard of minimum competency to be set

by the candidates for licensure, not by the licensed Subject Matter Experts who create the test and not by the boards that are responsible for issuing licenses.

Criterion Referenced

Compared to the two previous methods, setting the passing score by the criterion-referenced method is relatively expensive, difficult to administer, and time consuming because it requires evaluation of the relative difficulty of every exam item by a panel of SMEs. This evaluation is generally in terms of answering the question "what percent of minimally competent candidates will answer this question correctly?" The

The passing score... should define the minimum level of competence...

"Angoff method" is a commonly used criterion-referenced method of setting a passing score. There is an abundance of literature on setting passing scores, particularly on the criterion-referenced method. I do not claim detailed knowledge of the literature, but if you want to do your own research, these references will be a start. Angoff (1984) is a fundamental and extensive work that updates his earlier work (Angoff, 1971). Zieky and Livingston (1982) describe seven basic methods of setting a passing score, three of them in the criterion-referenced category. Warner (1986) provides a thorough explanation of the relative advantages and disadvantages of the three methods of setting a passing score, and relates each to how well it serves the goal of establishing minimum competency for licensure. The National Organization for Competency Assurance (1980—85) presents its criteria for cut-off scores. Mullins and Green (1994) review a challenge to the Angoff technique and provide a convincing set of responses.

The Angoff Method: An Example

A modified Angoff method is used by the National Association of State Boards of Geology (ASBOG) to establish the passing score for its licensure examinations. The Angoff method as applied by ASBOG's consulting psychometrician is similar to that described by Zieky and Livingston (1982). Overall, I am comfortable with the method after working with it for a few years. While I still want to learn more about it, the Angoff method is, in my mind, far more appropriate for licensure examination scoring than fixed percentage passing and norm-referenced scoring methods.

These basic steps are followed in setting the passing score for an ASBOG examination:

(1) A group of SMEs are trained in exam scoring and validation concepts.

(2) The SMEs take the examination for which they are about to set a passing score. If some of the items have been rated earlier, the experts take only the items that have not been evaluated previously. The SMEs take the examination without the key and in a simulated test environment. Well, they can get up and get a cup of coffee and bring it back to the table, but in general the atmosphere is realistic.

(3) With a psychometrician as facilitator, the SMEs then go over the items one by one. The SMEs agree on the correct answer (key) before the psychometrician tells them what the key in the item bank records says. This is a final check on item validity. All items have been reviewed many times before this juncture, but occasionally the SMEs will find an editorial or reproduction error, conceptual error, or an item that should be double-keyed. Once validity and keying are reconfirmed, we go to the next step.

(4) Each SME individually and silently evaluates the difficulty of the item by judging what percent of minimally competent candidates would get that item correct, and writes his or her number on a tally sheet. Then, in rotation, each SME states his or

her number to the group. Discussion may ensue (and usually does). At the close of discussion, each SME makes a final judgment in silence and writes down his or her (possibly revised) number.

(5) Only after the SMEs have committed their final judgment to paper will the psychometrician report the actual performance of candidates (percentage who chose the key) to the group. Additional statistical results may be discussed, especially if the psychometrician finds that performance on the item does not correlate well with the performance of those who score high on the test.

(6) When all items have been evaluated, the psychometrician can derive the raw passing score by averaging the expected total (minimum passing) scores from the tally sheets of the SMEs.

(7) The raw passing score is adjusted to a scaled score of 70 and the candidates' raw scores are adjusted proportionally.

Conclusions

A specific passing score should not be locked into a licensure statute because it will probably force the use of the fixed-percentage passing score method, which is an unrealistic way to set the passing score for a licensure examination.

The norm-referenced method of setting passing scores is also unsatisfactory for licensure examinations because it in effect allows the candidates to set the passing score and creates a standard that varies from one test administration to another.

The criterion-referenced method of setting a passing score is more cumbersome and costly to administer than other methods, but is fairest to the candidates, provides passing scores that are very close to the same level of difficulty from one examination to the next, and has the best psychometric validity when properly maintained. The criterion-referenced method is the only method that directly addresses the purpose of the examination: to relate the ability of the candidates to their competency to practice without unduly harming the public.

Chapter 17

What Role Should State-Specific Geology Questions Play In A State's Licensure Test?

The Issue

Most independently constructed state licensure tests have questions about that state's geology on them. The issue is how many questions are too many and how specific is too specific? Can some or all of these questions be replaced by different questions that accomplish the same goals, but eliminate the challenges that can come from having too many state-specific geology questions? The answers are important because they bear on reciprocity. This potentially affects the mobility of geologists and the degree of competition among geologists offering their services to the public and to employers.

This issue deserves recognition and attention. I do not think the problem is devastating to the validity of examinations, but I do think that a careful analysis will improve examinations.

Here are examples gleaned from two coasts. In Maine the 8-hour licensure examination has "Local knowledge sections...[that] include a section entitled `Maine Geology,' which takes one hour, and a section entitled `Environmental Geology,' which also is an hour. Although both focus on Maine as the primary subject, the questions are generally applicable across much of New England and the Maritimes, where geology, climate, and geomorphic processes are similar" (Andrews L. Tolman, written communication).

In California, regulations of the State Board of Registration for Geologists and Geophysicists imply that a candidate for engineering geology or hydrogeology certification should have (and be tested on) knowledge of California geology. In contrast, California Board regulations and law do not require California geology knowledge to be tested on the California Registered Geologist licensure examination. Nonetheless, anecdotal reports indicate that the California Registered Geologist examination occasionally contains fairly state-specific geology questions.

The role of, and justification for, state-specific geology questions on licensure examinations no doubt will always be a consideration in examination construction and in reciprocity policies. While an emphasis on home-state geology questions might seem logical at first glance, a state test with even a modest number of state-specific geology questions will be viewed by the consumer advocate as anticompetitive because they think it can keep out-of-state practitioners from coming into that state and passing the exam if it is required of them.

A dedicated state-specific exam section, such as in Maine, means that reciprocity outside of a local region will be impossible because no other state will test on Maine's geology as a specific topic or include sufficient closely related questions to be deemed an equivalent exam. Still, as a practical matter, this peculiarity in the Maine licensure examination does not seem to adversely impact the availability of adequate and competitive geologic services in Maine (Andrews L. Tolman, personal communication; see also Tolman, 1993).

The Plausibility Of State-Specific Geology Questions

Why, even in the absence of statutory requirements, do we find a significant number of state-specific geology questions on many state licensure examinations? I think there are two principal reasons. First, state geology questions are easy for the

exam writers to create because they are in familiar territory. Second, there is a surficial plausibility to questions dealing with state-specific geology and state-specific geologic hazards.

It seems reasonable to find more questions dealing with sea cliff retreat and coastal erosion and deposition processes on an Oregon exam than a Kentucky exam, or to find several questions on karst processes on a Kentucky or Florida exam, but not on an Oregon or Idaho exam. It seems plausible for the California exam to ask you if bedding plane landslides are more likely to be troublesome in the Modelo and Monterey formations than in the Ione Formation. Plausible though these approaches may be, can they be carried too far? Can there be too many state-specific geology questions on an examination? Can an exam have questions that are so highly specific that they establish competency in subject areas so technically or geographically or geologically limited that the test loses some validity? These are questions that Subject Matter Experts (SMEs) should be asking themselves as they create items.

The reasonableness of state-specific geology examination questions is belied by a curious inconsistency with respect to reciprocity. In some states, when an applicant is granted a license by reciprocity, she or he is given a license to practice in that state, but has not been specifically tested on the geology of that state. By granting reciprocity, the state board is, in effect, saying that knowledge about its state's geology isn't so important after all. If it is not all that important for out-of-state reciprocity licensees, then why is it important for home-grown and examined licensees?

Geologist licensure boards worry about this issue. They have to worry about it because their enabling acts require them to do so. It's called "exam equivalency" and is a big hurdle in establishing reciprocity. So why do some state boards grant reciprocity licensure to out-of-state applicants without testing them on the their state's geology?

One answer might be to consider that almost all geologists who request reciprocity are experienced well beyond the entry level. There is, in the granting of reciprocity, an implied recognition that the experience gained by the geologist since licensure in his or her home state balances the need for examination on the specifics of the geology of the reciprocity-granting state. The assumption is made implicitly that if they have been practicing that long, they ought to know enough to learn the (applicable) geology of the reciprocity-granting state before they get into trouble. In a recent article on the international implementation of reciprocity under the North American Free Trade Agreement, Ichniowski and Kramer (1995) report experience categories that have been defined for temporary licensure. Temporary licensure will be granted if an engineer has 12 years of experience, including 8 years in the home country. Thus, experience substitutes for meeting many other qualification requirements in this case.

Another answer might be that the general geology of the two states is fairly similar. Anyone who can answer three questions about pegmatites in the Werner pluton in state A can answer three questions about pegmatites in the similar Warner Pluton in adjacent state B, so why make them take the test?

If a state board thinks that the geology and geologic hazards of its state pose a unique suite of challenges, it will generally tend to deny reciprocity if its examination is laden with state-specific geology questions. The issue here is should the examination focus on knowledge of fundamentals and principles, the skills needed to apply them, and reasoning ability that will indicate that the applicant can recognize and solve local geologic problems, or should the exam focus on knowledge that those local geologic problems exist?

Can Other Questions Serve As Well?

Consultants experienced in interstate and international practice will argue that geologic units and hazards do not follow political boundaries, and that it is the responsibility of the consultants to learn what they need to know about project-specific geology in every state or country in which they practice. If this is true (and I think it is), then it would be appropriate for

all licensure tests to contain questions that allow the applicant to demonstrate that (1) they recognize the need for them to do location-specific, as well as topic-specific, geologic literature searches and related research, (2) they know how to go about doing a literature search, and (3) they know how to pursue the other means of developing the geologic information they need when practicing in unfamiliar territory.

Evidence of liquefaction is much the same whether found on the West Coast, in the New Madrid earthquake region, or around Charleston, South Carolina. The appropriate exam question is not "In what formations or units (or geographic areas) in the state of X would you expect to find evidence of liquefaction?" but "Which of the following features might be strong evidence of previous liquefaction?"

A geologist who wants to practice in California or Oregon might need to learn about

...licensure boards worry about this issue.

sea cliff retreat and tsunamis, but should the licensure test ask them to mark spots on a map to indicate areas that have historically suffered from those hazards or to demonstrate that they know generally why and where they are dangerous, and know how to find out about the local specifics if they need to?

My experience as an SME for the ASBOG (National Association of State Boards of Geology) examination forms my opinions on this issue. When the SMEs reviewed item banks from several states we had no problem recognizing and discarding items that we felt were too state-specific, given our goal of creating a national examination. We were able to recognize the underlying principles behind state-specific questions and, while it was not always easy, we did create new, more generally applicable, items based on those principles.

If we can test on the principles underlying state-specific geology questions instead of asking those questions, I think we have a better test because it covers more practice situations than a highly targeted set of state-specific questions. By going back to the underlying principles, we are emphasizing questions that test how geologists think and test their ability to recognize problem situations instead of what they know in detail about those problems.

Professional Practice Questions

There are some areas in which state-specific testing, in my opinion, is justified. One such area is basic knowledge of a given state's licensure laws, applicable practice regulations, and licensure board policies, including a code of ethics if the state board has one. The other area has to do with a given state's laws, regulations, and guidelines as to the requirements for, and contents of, geologic reports. We can call these professional practice question areas.

If, for example, a statewide building code requires certain geologic reports to support land development, then questions about that part of the code would be justified. A state might have special report or investigation requirements with respect to mined land reclamation, quarry closure, timber harvest plans, active fault investigations, on-site sewage disposal, groundwater and soil contamination studies, or landfill siting. These would be appropriate areas for state-specific testing of all applicants by means of a supplemental test.

There is a danger that professional practice questions could become license-busting nit-pickers if the same care lavished on technical exam questions is not applied to them. Rather than including professional practice questions in the formal examination, they might best be given to both in-state and reciprocity applicants as a separate take-home open-book examination. This concept is parallel to the take-home open-book examination on practice and ethics issues that is currently given to engineering licensure applicants in California when they complete their written technical examination. Arizona, at one time, also used a supplemental test to evaluate knowledge of the board's practice rules. The test was given in an essentially open-book environment.

Conclusions

A licensure test with a large number of state-specific geology questions on it might be challenged because (1) basic geologic principles and theory do not change as one moves across political boundaries, (2) geologic units and hazards do not follow political boundaries, (3) a concentration of state-specific geology questions is anticompetitive, and (4) it is possible to devise adequate substitute technical questions that address the direct or underlying principles, and these questions might well be better evaluators of readiness to practice than state-specific geology questions.

A state licensure board may reasonably use a supplemental examination on the policies of the licensure board and the codes, guidelines, and regulations governing practice in that state, including report-writing standards particular to that state. This type of supplemental exam is justified for applicants for initial licensure, as well as applicants desiring licensure by reciprocity, and might best be constructed as an take-home open-book examination.

Chapter 18

Why Grandfathering?

Introduction

Licensure tests and grandfathering are emotional topics among both the proponents and the opponents of professional licensure. I have been through the process both ways, being licensed by grandfathering in one state and by examination in another. "Grandfathering" refers to the customary practice in licensure acts that permits, for a limited time, highly experienced practitioners to become licensed without examination if they meet all the other criteria.

This chapter answers the following questions. What is the role of the licensure test in protecting the public health, safety, and welfare? What are the limits on the test in fulfilling this role? If a test ensures competency to practice, why is grandfathering done at all? What does a licensure test really test? What does passing a licensure test really prove? Should licensed geologists be retested every few years? Can a college degree substitute for the licensure test?

It is not the purpose of the licensure test to ensure total competency to practice. If it were, the test would probably require at least 30 days to take and the only passing score would be 100%. A licensure test, like almost any comprehensive test, can test only a sample of the body of knowledge involved. It is the purpose of the licensure test to ensure that only those individuals who demonstrate minimum competency as measured by accepted criteria are permitted to assume full personal professional responsibility for their work and the work of others when their work product and applicable law demand it; to move, in essence from journeyman to master level in practicing before the public.

Why Grandfathers Are Not Tested

When a new practice protection licensure act that requires testing becomes law, why do we consistently have a grandfather clause? Why shouldn't everybody be tested? The answers to these questions lie in public policy, and in the purpose of the test. As a matter of public policy, legislatures will not pass a law that potentially puts a significant number of currently active practitioners of a given occupation in immediate jeopardy of losing their ability to earn a living at their chosen work.

It is for this overriding reason that all but one of the new standards are imposed on currently active and experienced practitioners of a profession, and that all the new standards are imposed on new entrants and those practitioners who have only a modicum of experience and career development behind them. Keep in mind that grandfathers must meet every requirement of the new licensure law except passing the test.

Is there another reason that grandfathers are not tested? The answer to that question lies in the purpose of the test. A typical geologist with, say, 10 or more years of progressively responsible and specialized experience, will be uncomfortable with the thought of taking a licensure test. Why? Because it means going back to basics. It means getting out all the old college textbooks and the in-house training manuals and short course notes from the first few years of employment. This is because the licensure test is an entry level test. It tests for the knowledge, skills, and abilities deemed to be necessary for one to begin independent practice before the public as the professional in responsible charge of the work. [In common usage the term "entry

level" in the context of employment that requires a college degree means that one has acquired the degree, but not any substantial experience. The term "entry level" in the context of licensure means a person who has both the degree and the experience necessary to take all of or the final part or parts of the licensure examination. In the context of licensure, "entry level" generally means about 5 years of postbaccalaureate experience (Hertz, 1995).]

The licensure test is designed to test basic academic knowledge and the basic practical knowledge, skills, and abilities learned the first few years on the job. But the decade-plus experienced geologist typically is highly specialized and mostly uses postgraduate, job-learned knowledge and scholarship that is based on, but goes well beyond, knowledge acquired in college and in the first few years of employment. An awareness of what sorts of academic knowledge exist is certainly there, but not the ability to go back to "Structural Geology 301" and ace the first mid-term examination. Yes, he or she knows where to go for that tidbit from stratigraphy, mineralogy, or structural geology, or better yet, knows specialists in those fields with whom to confer. But, at this and later stages of one's professional career, having all this basic knowledge at one's fingertips is not the essence of one's value to one's employer or client. Neither does it figure as critically in one's duty to protect the public as do some of the skills and abilities discussed below.

Vesilind (1991b) surveyed civil engineering graduates on the usefulness of curriculum subject areas at various career stages. The results indicate that in later career stages management, communication, and writing skills assume greater importance in proportion to technical knowledge and skills. People in later career stages are "grandfathers." The knowledge, skills, and abilities that are of key importance to them, to their employers, and to the public affected by their practice are not tested on the typical licensure test because the test emphasizes entry level professional knowledge.

Katz (1974) defines three principal areas of skill: technical, human, and conceptual. His work also points out that the technical skills give way in importance in later career stages to skills not learned in college in a technical curriculum. This, too, supports the concept that grandfathers are doing many job tasks not tested by a licensure test that must, by design, test entry level knowledge.

Grandfathers aren't tested because their careers are at a stage well beyond the threshold the test is designed to define. Grandfathers aren't tested because public policy exists that forbids putting their careers in jeopardy by forcing them to take a test that does not measure their abilities in their current professional work. Do a few people become registered through the grandfather clause who perhaps shouldn't be? Probably yes, but if these people make heinous mistakes then the disciplinary sections of the licensure law can be invoked to eliminate them from self-directed practice. Without a licensure law, they could practice and make mistakes much longer.

Retesting Licensed Professionals

Should licensed professionals be retested occasionally? Given the purpose and scope of the licensure test, the answer is that retesting licensed professionals with the entry level licensure test serves no useful purpose because the licensure test given early in a professional career is not suited to testing the knowledge, skills, and abilities needed and used by the highly experienced professional.

To ask a grandfather to take a test or to ask the long experienced geologist to retake a basic licensure test is to ask a master chef to recite from memory the recipe for chocolate chip cookies, or to ask a 15-year Boeing 747 pilot to demonstrate his skills in the Cessna 152 in which he learned to fly, but hasn't flown for 30 years. The process is meaningless, given the duties of and the knowledge, skills, and abilities currently used by the highly experienced professional.

Here is a real-world reality check that attests to the validity of these concepts. For several years I, along with other SMEs, have taken all or part of the ASBOG licensure test twice a year in examination workshops. Here we have a group of grandfathers who

are indeed being retested with the basic licensure test just what some critics want. Our experience confirms to me (and to my fellow SMEs) that asking longtime registrants to retake the licensure test every few years is insupportable. Our experience confirms that the entry level licensure test does test what one needs to know to demonstrate minimum competence at the entry level, but it does not test the advanced knowledge and skills used by practitioners with many years of experience.

Retesting With "Specialized Tests

Well-developed professional judgment and the ability to make shrewd insights, along with advanced technical knowledge, project management skills, and report writing prowess, are what employers and clients value in grandfathers. These are the things that must be tested if one wishes to ask grandfathers to reestablish their competence in a retest. It would be a Herculean task to design and administer a suite of tests suited to the variety of specialization found in the grandfather population. I think it would be especially difficult to test professional judgment, so much used by the experienced geologist. [Professional judgment is the ability to use inductive thinking and inference in an organized way to resolve problems that cannot be reduced to numerical or graphical bases (Fish, 1950).]

If testing or retesting grandfathers on a formal basis is unworkable, is there another means of evaluating their continuing competence? Yes. If a board has a strong and fair disciplinary program, it will serve the function of retesting by controlling practice errors. The pitchfork that a board uses to winnow the wheat from the chaff has three tines, each with its own job to do in its own time, and each making up its part of the whole tool: qualifications review, examination, and discipline.

My opinion is that strong and fair enforcement is a better tool than retesting to assure continuing competency of experienced practitioners.

Can A College Degree Substitute For A Licensure Test?

The argument is sometimes made that licensure tests are not necessary because graduating from college demonstrates that a professional has the necessary knowledge to practice. For example, McLeod (1992) says "...registration boards have usurped the authority of accredited colleges and universities to verify the academic worthiness of entry-level geologists." I am unaware of any licensed design profession in which the licensing authority accepts a degree (or a degree plus experience) in lieu of passing a licensure test once the grandfathering period has ended. If colleges were providing all graduates with 100% of the knowledge they need to practice before the public, then the pass rates on psychometrically validated licensure examinations would be close to 100%, but they aren't.

A licensure test grades not only the academic knowledge, but also the knowledge, skills, and abilities acquired in the early postacademic environment (on the job training and learning) that are needed to begin independent practice before the public in responsible charge of the work.

A college degree attests to the academic background of an individual. It says he or she is educated in the basics and ready to enter the profession. A college degree, however, does not (and is not meant to) certify that the new graduate is ready to assume responsible charge of complex professional work, or will be ready in a given number of years. Making that determination is the function of the licensure process.

Should licensed professionals be retested occasionally?

A graduated professional possibly may have a lifelong career in industry or government and never have a need to be licensed. There is a filtering process that occurs over the early years of professional practice; only those individuals with a certain amount of interest and dedication,

and the desire to practice before the public, make it to the licensure test level. To grant licensure automatically to all college graduates would be to grant a privilege to those who do not have enough practical experience to use it wisely and well. Not needing the privilege and not being dedicated to the profession, they will be less than apt practitioners if they ever do engage in the public practice of the profession. This situation will not protect the public.

At least some professors in charge of curriculum development feel that their only classroom job is to educate students according to prevailing academic standards. They believe that if their curricula happen to omit courses and concepts that a licensure board thinks the student needs to practice as a registered professional in responsible charge of the work, then the problem lies not with their curricula, it lies with the licensure board. I side with the boards on this issue. Individuals in charge of curriculum development owe it to their students to make them aware of and to offer them the training the board says they need to move into responsible licensed positions. If the academics disagree with the board's standards, they should engage in a dialog with the board, but they should not ignore the board's standards and send unprepared students into the world.

Conclusions

Grandfathering provisions represent a common aspect of statute implementation: a phase-in operation.

It is not the purpose of the licensure test to ensure total competency to practice. It is the purpose of the licensure test to assure that only those individuals with demonstrated minimum knowledge, skills, and ability (minimum competency) are permitted to move from an early stage of their careers to an advanced stage where they will have independent responsible charge of professional work that impacts the public health, safety, or welfare, or is practiced under the purview of the public interest.

The difficulty of adequately testing things that are important in the work of a wide variety of highly experienced professionals is the reason grandfathers are not tested when a new licensure law becomes effective. It is also the reason retesting of highly experienced professionals is impracticable. A strong and fair discipline program works better than retesting in controlling the work of professionals once they are licensed.

A university degree is not a substitute for a license to practice a profession, nor should possession of a degree be cause for automatically granting a license to practice a design profession.

Chapter 19

Continuing Professional Education Voluntary Or Mandatory?

Introduction

Continuing Professional Education and Licensure

Continuing professional education, particularly mandatory continuing professional education, is becoming closely linked to professional licensure. What does this mean for the profession of geology? What is continuing professional education? Should it be mandatory or can it be voluntary? Should allowable continuing education be restricted to formal settings with rigid attendance, verification, and examination standards?

I'll use the term "continuing professional education" (or CPE) to include all aspects of professional development activities during postbaccalaureate employment. Other terms that mean nearly the same thing in the context of this chapter are continuing education (CE), continuing professional development (CPD), and continuing professional competency (CPC). CPE in its various guises has been a matter of discussion among professionals for many years. Curtis (1988) indicates that the topic first arose in the National Council of Examiners in Engineering in 1944.

There are indications that CPE will commonly be required in the future for renewal of a professional license. I'll cite several references to CPE in the community of professional engineers because the engineers are a little farther down the road than we geologists in the implementation of mandatory CPE. They are the best example we geologists have of our own CPE future. Pennoni (1993) and Escobedo (1993) review the movement toward mandatory CPE in engineering practice.

Currently CPE is or soon will be required for professional engineer license renewal in Alabama, Iowa, Michigan, North Carolina, New Mexico, Nevada, and West Virginia (National Society of Professional Engineers, 1995). A bill recently introduced in the New Jersey legislature to mandate CPE for licensed engineers levies fines of up to $500.00 for a first offense of not complying with the law, and additional professional misconduct offense charges for a second violation. Turner (1995) reported that the California Board of Registration for Professional Engineers and Land Surveyors was seeking "...statutory authority to require continuing education...."

Licensed geologic practice is subject to mandatory CPE. The South Carolina Board currently requires continuing education of its geologist registrants. The Wyoming geologists registration act, passed in 1991, mandates continuing education for registrants, as does the Missouri act passed in 1994.

Widespread support for mandatory CPE seems to be lacking at present in the geologic community. The most support comes from regulatory geologists and geologists who are personally committed to CPE.

What is the Scope of Continuing Professional Education?

Pennoni (1993) quotes The Royal Institution of Chartered Surveyors' (London) definition of continuing professional development: "It is the systematic maintenance, improvement, and broadening of knowledge and skill and the development of personal qualities necessary for the execution of professional and technical duties throughout the practitioner's working life."

Poirot (1993) notes that continuing professional development includes "business, law, ethics, marketing, government policy, and information technology." Yong (1990) quotes an unreferenced UNESCO publication that defines CPE as "designed for practitioners in the professions or high-level occupations to keep them up to date with new developments in their field, to acquire new skills related to their profession or occupational setting, and to understand the societal context in which they work."

These rather broad-minded concepts lead us to think that (1) appropriate continuing professional education subject matter, (2) the method of delivering the subject matter, and (3) verification that the subject matter has been learned require only the simplest reports and controls for a successful and valid continuing education program. We can characterize this type of mandatory CPE as being open-ended, self-audited, and unverified. It is open-ended because it accepts a wide variety of subject matter and delivery and learning methods. Further, these subjects are not necessarily or demonstrably related to the knowledge, skills, and abilities (KSA) needed for practice competency that impacts the public health, safety, or welfare. This CPE is self-audited because those taking it are not always under a stringent level of supervision or observation while they are taking the CPE, and they generally can report some or all of their CPE to a licensure board without an instructor's signature and with little risk of an audit. This type of CPE is unverified because there are no stringent program controls imposed to evaluate the worth of accepted CPE activities on an activity-specific basis, and because psychometrically valid examinations are not given and graded for each CPE activity.

For example, the South Carolina Board accepts such activities as college geoscience courses (resident or correspondent), noncollege correspondence geoscience courses, in-house seminars, and being a lecturer for certain events. With respect to annual meetings of geoscience organizations it accepts attending an annual meeting, being an author of a paper or poster, being a host chair or committee chair, and taking a field trip or being a field trip leader (South Carolina State Board of Registration for Geologists, 1991).

Organizations that offer CPE training gain from their offerings.

Other jurisdictions might allow credit for a variety of CPE activities. Escobedo (1994) reports that the National Council of Examiners in Engineering and Surveying (NCEES) Model Rule on CPC allows CPC credit for the usual activities, plus "actively participating in...televised, videotaped, and other short courses/tutorials; authoring published papers or books; actively participating in professional or technical societies; [and] obtaining patents."

Morrison (1993) envisions a much stricter set of CPE standards. He restricts the scope of CPE by enumerating several principles, among which are the following: (1) "continuing competence requirements should be validated by reference to specific performance competencies...required for...continued safe practice...." and <2) "continuing competence must be accompanied by a requirement that the practitioner present credible evidence that he or she possesses the required competence....This evidence must be criterion referenced. Mere participation in an educational activity, no matter how well structured, does not constitute acceptable evidence that competence has been acquired."

Morrison's (1993) definition of acceptable CPE activities is in strong philosophical disagreement with the way CPE requirements are usually implemented in the design professions. His argument is logical: if we require validated and criterion-referenced examinations to demonstrate competency upon initial licensure, and if CPE has the purpose of assuring continuing competency, then consistency requires that the same standards be applied if we demand evidence of postlicensure continuing competency. CPE activities that meet these criteria could be characterized as KSA-related, independently audited, and verified. KSA-related

means that the activities are shown to be related by psychometric evaluation to the knowledge, skills, and abilities needed to perform specific job tasks that impact the public health, safety, and welfare. Independently audited means that the records of practitioner participation are not kept and submitted to the licensure boards by the practitioners, but by the instructors or instructing institutions. Verified means that the learning of job-related knowledge has been verified by psychometrically valid examinations.

Who Wants Continuing Professional Education?

It's probably safe to say that the majority of active licensed professionals want CPE—as long as it is voluntary. Professionals operate in a competitive environment. They know that one very important way to keep ahead of the competition is to be up to date in their primary technical field and in ancillary fields. Professionals also realize that to serve the public they must have the appropriate knowledge. Yong (1990) points out that CPE is a way to demonstrate professional accountability that, in turn, demonstrates professionalism.

Organizations that offer CPE training gain from their offerings. Professional associations commonly design their continuing education programs to produce a fiscal surplus that is used to keep basic dues relatively low. Commercial providers of continuing education are clearly influenced by the profit motive. Paxton (1994) indicates that when the Colorado Board of Nursing held a hearing to determine the fate of its mandatory CE requirements, the only witnesses who spoke in favor of keeping the requirements were those "affiliated with a provider of CE courses...."

Many politicians and consumer advocates who favor mandatory CPE rely on unsubstantiated assertions, such as "There are a lot of professionals out there who haven't been in a classroom in 15 years." Jaeger (1994) reports a source as indicating that the lack of mandatory CPE for Virginia engineers was a point of criticism when the legislature considered a proposal to abolish licensure for engineers. In one profession, architecture, the Registration Law Advisory Task Force (1980) notes that "The two changes most frequently seen as a result of Sunset review are public members on boards; and board authority to prescribe continuing education requirements."

Mandatory Continuing Professional Education

How Strong is the Case for Mandatory Continuing Professional Education?

The argument for mandatory CPE is based in large part on two general assertions: (1) a need to protect the public by forcing the marginally competent professionals to bring their competence up to an acceptable level through CPE, and (2) the public will also benefit if we force competent professionals to take CPE training regularly, because many of them will not do it of their own volition. The case for mandatory CPE in the design professions is supported mostly by general observations and assertions leading to plausible conclusions. An example is the thought, "the half-life of the body of knowledge of an engineer is five years and shrinking...." (Pennoni, 1993). Support might also be drawn from work such as that of Slosson and others (1991), who review a decline in the quality of geologic reports submitted to regulatory agencies, and conclude that the gap between the state of the art and the standard of practice is widening. One might well conclude that mandatory CPE is necessary to close the gap and protect the public.

Slosson and Petak (1989) note that many geology graduates have not had the fundamental academic courses needed to prepare them to work effectively in the fields of hydrogeology, engineering geology, and hazardous waste management. Slosson and others (1991) note that many geology departments are dropping "applied" courses that are needed to practice in ways that impact the public health, safety, and welfare. Perhaps mandatory CPE is necessary to address the absence of appropriate college courses.

Part of the case for mandatory CPE is built on its adoption by other professions. The accountants and architects have it, so why shouldn't we? Engineers may adopt mandatory CPE in part because the architects have done so, and in part because they think that the public holds a profession in higher esteem if it has mandatory CPE (see Jaeger, 1994; and Jones, 1994). The National Society of Professional Engineers recently modified its policy on CPC and now "...supports a policy of mandatory continued professional competency for engineers and land surveyors," (National Society of Professional Engineers, 1995). If engineers adopt mandatory CPC or CPE, will geologists, many of whom work with engineers, feel pressured to adopt it, too?

Mandatory CPE does not necessarily reduce a Board's discipline load. Paxton (1994) reports that more than 95% of the nurses disciplined by the Colorado Board of Nursing "faithfully met their continuing education requirements...."Patricia Peters, executive secretary of the Iowa Engineering and Land Surveying Exam Board, noted (personal communication) that there was no dramatic change in the number of complaints following the implementation of mandatory CPE by the Iowa Board in 1978. One might infer from these observations that mandatory CPE does not narrow that gap between the state of the art and the standard of practice, but we have no information about whether the severity of the complaints filed with these boards has changed for the better even if the rate of complaint filing was unchanged after the implementation of mandatory CPE. The issue needs more research.

Can the Results of Mandatory CPE be Measured Objectively?

Generally, where mandatory CPE has been implemented, measurable results are not obtained or are not as conclusive as one would like. Patricia Peters, executive secretary of the Iowa Engineering and Land Surveying Exam Board, stated (personal communication) that the Iowa Board, which has had CPE requirements for its engineer licensees since 1978, has never attempted to determine if competency had increased since CPE became mandatory. She expressed doubt that a valid study could be devised to measure the effect of CPE on professional performance.

I found one reference to a scientific study of the effects of implementing a mandatory CPE program on licensed professionals by a licensure board. The New York state legislature required a scientific study of the effects of the mandatory CPE requirement implemented for Certified Public Accountants who engaged in public practice. According to C. Daniel Stubbs, Jr., CPA, executive secretary of the New York State Board for Public Accountancy (written communication), "The study indicated...a consistent positive relationship...between level of participation in continuing education and accountants' knowledge proficiency. Heightened knowledge proficiency was the conclusion since it is extremely difficult to objectively evaluate whether the quality of professional practice has been impacted." This seems to tell us what we already suspect: CPE will likely result in some measurable positive change in the knowledge held by those who participate in it, but there is no reasonable and objective way to determine if this increase in knowledge effectively translates to improved practice proficiency or improved protection of the public health, safety, or welfare.

Can Mandatory Continuing Professional Education be Adapted to Meet the Characteristics of Geologic Practice?

The answer to this question is "Yes, but...." The crux of the problem is this: geologists are field based and client driven (or employer driven) in accordance with project demands. Mobility is a must.

The typical consulting geologist in early career stages spends much more than 40 hours a week on the job, at least for occasional periods of several weeks. Often this time is in the field and is distant from sites of formal education. The client comes first. Where is the time available to go back to school even for a 3-unit night course?

Given the need for rapid response to continuously shifting client needs, how can a consulting geologist plan for a multiweek

CPE commitment? Where does a California geologist go for CPE when assigned to rural West Virginia for a 6-week field program that lasts for 5 months?

In mid- and late career, a consulting geologist might be a project manager whose schedule changes from hour to hour and for whom 50- to 60-hour work weeks spent in two or three cities per week are not unusual. It is impossible to accommodate classroom-type structured and formal continuing education to the lives of these people. If continuing education is to be mandatory and only courses meeting the criteria proposed by Morrison (1993) will be accepted, the burden on the profession will be tremendous and unreasonable.

Certainly, some flexibility must be built into any continuing education system, mandatory or voluntary, that requires a detailed accounting of hours. Some hours must be bankable from 1—2 years into the future, so the geologist assigned to Timbuktu for a year does not lose his or her license for not getting a certain number of hours of classroom instruction or technical meeting attendance that year.

Adapting mandatory CPE to meet the practice characteristics of the geologic profession requires two things: (1) fairly generous banking of hours or credits, preferably both forward and backward in time from annual or biennial deadline dates, and (2) acceptance of a wide variety of subject matter and delivery vehicles. Both of these conditions can be met; however, such a system abandons strict accountability for attendance, abandons formal validation of course content as being related to specific and necessary performance area competencies, and abandons verification of actual learning of the competencies by criterion referenced and psychometrically validated examinations. If we must abandon these standards to have a workable mandatory CPE program, how can we think that it has any scientifically based validity? How can we justify a claim that it meets the goals it was created to achieve? We can't. The validity and efficacy of such a program is taken on the basis of faith, not science.

What Are the Negative Aspects and Impacts of Mandatory Continuing Professional Education?

Mandatory CPE can be anticompetitive. CPE programs seem to be set up on the assumption that all practitioners are full time, working 40-hour weeks, and working for large companies that can afford the relatively small resulting increment in overhead costs. For small companies or sole proprietors, who play a vital role in the marketplace, the burden of continuing education is relatively large. Indeed, the cost and time to meet CPE requirements might be prohibitive to part-time practitioners, driving them from the marketplace and depriving consumers of their talents and services (Virginia Board of Commerce, undated).

When mandatory CPE is implemented in a state, out-of-state registrants may drop their licenses in that state due to cost and inconvenience. Gara and others (1981) note that when mandatory CPE for architects was imposed in Iowa in 1980, "All Iowa-based architects met the requirements, but 30 percent (250 in actual number) of out-of-state architects registered in Iowa lost their Iowa registrations by failing to comply with the continuing education requirements." Some of this decrease is simply a matter of professionals who maintained out-of-state registration for marginal reasons being prompted to drop their license by CPE requirements; some of it probably represents a true loss of competition in professional services to the people of the state.

CPE programs do cost money, not just in out-of-pocket dollars, but in opportunity costs and in income lost while attending courses, and adding to the difficulty of scheduling the work of employees. This overhead cost is ultimately passed on to the consumer.

The greatest drawback to mandatory CPE as it is typically proposed and implemented in the professional practice of geology is that while it is admittedly strong on warm, fuzzy feelings, it is utterly lacking in accountability and verification of the actual learning of job-related competencies. There is no guarantee that those who are

forced to take CPE training will take training in subjects applicable to their practice and in which their knowledge and skills are weak or outdated. Indeed, there is no guarantee that those who are forced to take CPE training will learn anything at all! There is no control on the experiment. We'll never know with any assurance if the program has had a positive impact or has hit its primary target.

Voluntary Continuing Professional Education

Voluntary CPE comes in several degrees of "voluntary." In a completely laissez faire situation, neither the boards of registration, professional associations, nor any other agency requires CPE or even recommends it through policy. The next stage is for one or more concerned regulatory agencies to establish policies recommending the scope and amount of CPE they believe to be appropriate for professionals practicing before them or the public. Or perhaps a professional, technical, or trade association might adopt a policy favoring or recommending voluntary CPE. The policy could have some detail as to the types and amount of CPE recommended, or leave those issues untouched.

The next step in this progression might be called semivoluntary CPE. Typically, this step is taken by professional or technical associations when they require some level of CPE to maintain membership or certain membership privileges. From the standpoint of the practitioner, this CPE program can be called voluntary only insofar as membership in the professional association is voluntary.

Professional associations fear that making CPE mandatory for continued membership will drive members away if there is no statutory support behind it. Only recently have major national design professional associations, such as the American Institute of Architects, started to phase in mandatory CPE for membership renewal. It will be interesting to see what happens to the membership roles of professional associations as their own mandatory CPE requirements take hold without parallel regulatory CPE requirements. Could so many members drop out that the mission of the association is imperiled?

Conclusions

To have or not to have mandatory continuing professional education. We face a three-pronged dilemma.

If we choose to support mandatory CPE and remain faithful to our basic tenets as scientists, it would seem that the only one style of mandatory CPE is scientifically valid: a universal requirement for mandatory CPE that meets the same level of psychometric (scientific) rigor required for initial licensure. While the supporting logic is inescapable, this system would be an intolerable and unworkable burden on our profession as it must be practiced.

Should we settle for second best? Should we settle for supporting a mandatory CPE system that could be implemented on all of us by legal or regulatory mandate (or by our professional associations) and yet not be an intolerable burden on our practice? This mandatory CPE system is so lenient in reporting and verification of learning as to be indefensible under the most casual of challenges. Yet, this is precisely where we geologists are headed, along with many other professionals. Once this type of mandatory CPE becomes prevalent, my plea is merely this: that we geologists not let the public or ourselves think that it has any significant level of scientific validity, let alone the ability to hit its primary target. The fact is that those who need CPE the most can and will thwart this system with ease. Like a lock that is easy to pick, the second-best CPE system will inconvenience honest people, but offer little resistance to those who scoff at its function.

Neither a purely voluntary, laissez faire, system of CPE nor a CPE program that is mandatory for maintenance of membership in a professional association addresses the problem to be solved. Those who need CPE the most will simply not take it under either of these approaches.

The basic goal of mandatory CPE is to force some practice area competence on those very few who need to be force-fed. The basic flaw of mandatory CPE as it has been and is proposed to be implemented in

geologic practice is the unacceptably low level of confidence that it will actually do some good by hitting its intended targets in meaningful and psychometrically valid fashion.

All the implementation schemes discussed so far use the shotgun approach. How about a sharpshooter approach? Is there a mandatory CPE system that hits its target squarely and gives no grief to the honest and ethical practitioner? Could this system be one we can all support as effective? Could we guarantee that the public will be well served by this system? Yes, there is such a system.

Mandatory CPE that Works

What type of mandatory CPE program can assure us that it hits its intended targets without needlessly ensnaring the innocent? Answer: one imposed by a Board of Registration under its disciplinary functions in the settlement of complaints against licensees. Requiring CPE in specific areas related to identified competency deficiencies, with strict accounting for attendance and formal reporting back to the board, and with verification that appropriate knowledge has indeed been learned, should be a common element in the resolution of discipline cases. This type of mandatory CPE program meets at least the spirit of the rigorous criteria proposed by Morrison (1993). It imposes no costs or unnecessary burdens on the great majority of licensees—those who are honest and conscientious—and we know it hits its target: licensees who need CPE.

Chapter 20

What Is The Role Of Enforcement?

Introduction

A board issuing licenses to practice a profession has two main programs to control professional practice, the licensure program and the enforcement or compliance program. Tilford (1990) notes, "The most common and significant criticism of professional registration lies in the perception that appropriate penalties are not promulgated and enforced." Scullin (1992) also discusses the need for board enforcement. Legislators and consumer advocates who berate boards for low enforcement rates seem to know what they want (more enforcement), but none I encountered were able to cite specific examples of acceptable enforcement levels or give objective justification for their general goals.

If a board's licensure and enforcement programs operate in balance and with mutual feed-back, the efficiency of each program will be optimized, and total cost (and inconvenience) to the profession and the public will be minimized. But how do we know "how much licensure is enough?" and "how much enforcement is enough?" With no objective analyses available, we must be satisfied for now with an evaluation of the status quo, based on informed opinion.

The goal of professional licensure is to protect the public health, safety, and welfare by admitting to independent, supervisorial, or self-directed practice in responsible charge only those candidates who demonstrate at least minimum competency. Licensure of qualified candidates (and denial of licensure to unqualified candidates) can be achieved with reasonable objectivity by the use of validated written examinations and the verification of credentials demonstrating that the candidate meets certain standards. The licensure process can be viewed as the first part of the enforcement program. Licensure functions, especially examination functions, are by far the biggest part of the work of a licensure board.

Once licensed, professionals are free to practice within their fields of expertise. Many forces and conditions, including market forces (Slosson and others, 1991; Scullin, 1992) can impact professional practice, and occasionally professionals do not meet current practice standards. A licensure board must have an enforcement program as a means of requiring professionals whose practice is found to be substandard to bring their competence into compliance with current standards. Enforcement programs also have a goal of preventing unlicensed practice.

Tilford (1990) provides an important insight. He notes that licensure involves three steps: credential evaluation (education and experience), examination, and enforcement. Further, "The first two standards, (1) education/experience and (2) examination, will likely eliminate the most serious potential offenders." I think this is true, and I think it means that even with a vigorous enforcement program, a board that has a good examination and valid credential and experience requirements will find it only rarely necessary to revoke a license. In turn, this means that having a variety of lesser sanctions is all the more important.

Shimberg (1982) states, "The goal of disciplinary action should be to upgrade the licensee's practice where possible and to remove him from active practice only when rehabilitation is not a viable option." I agree with this goal as stated by an eminent critic and evaluator of occupational licensure. If the first part of this goal, upgrading practice, is achieved, the second part (revoking licenses) will seldom be necessary. In evaluating board enforcement programs,

we should realize that the number or rate of license revocations is not the key index of success. I would prefer to think that if a license must be revoked it means that failure has occurred somewhere in the licensure and disciplinary processes.

Many professionals and their associations support vigorous, fair enforcement by licensure boards. Thirty percent of the evaluation forms returned by geologists who attended the National Colloquium on Professional Registration for Geologists at AEG's 1990 Annual Meeting mentioned the need for more or better enforcement. The Association of Engineering Geologists Policy Statement on Registration for Engineering Geologists, adopted in 1987 (in Smith, 1995), states, "No registration law or licensure act can be effective unless there is provision for disciplinary action against those violating the law or act....the Association encourages...state registration boards to take strong and decisive publicized steps involving reprimands as well as legal action where justified." The summary of the National Society of Professional Engineers (1995) policy statement on enforcement of licensure is "Support inclusion of a comprehensive portfolio of investigative, enforcement and disciplinary powers in engineering licensing statutes. Support rigorous application of enforcement and disciplinary powers."

One of the goals of the team of geologists who wrote the Suggested Geologists Practice Act was to assure that a geology board created by it had broad, meaningful, and effective enforcement powers. Curtis (1988) chronicles the long-standing desires of engineers and their licensing boards for effective discipline.

Study Method

This chapter evolved from a volunteered report that I submitted to the California State Board of Registration for Geologists and Geophysicists (Tepel, 1994). At that time, as now, I was unable to locate any well-targeted objective studies in the literature that treat the question of how much enforcement is enough and how to know when we have enough enforcement.

From 1993 to 1995, I interviewed, either in person or by telephone, about a dozen geologist licensure board members and administrators from eight states to build a basic understanding of board enforcement programs and authority. A summary of the interview results is presented in Table 20-1. I also interviewed several geologists employed in permitting or regulatory agencies in California to ascertain their views on enforcement by the California State Board of Registration for Geologists and Geophysicists.

I collected information that came to my attention from other sources, such as media reports, the report of a certifying professional association, and an annual report of the California State Board of Registration for Professional Engineers and Land Surveyors.

Some Discipline Numbers

To set the stage for the discussion that follows, let's look at a few recent examples of discipline. Because I did not undertake an exhaustive research program by contacting hundreds of licensing boards and dozens of certifying associations around the country, the following data may not be representative. My conclusions must be regarded as tentative. Using these data to set enforcement goals for any licensure board is not justified. Nonetheless, I am optimistic that the numbers reported are not only typical of what might be found in a more comprehensive study, but also fall within the range of reasonably expectable enforcement rates; however, I don't know how wide the "range of reasonably expectable enforcement rates" might be.

The California Board of Registration for Professional Engineers and Land Surveyors receives roughly 200 to 300 complaints a year (M. Fagunes, personal communication). Overall, the board typically disciplines (through formal proceedings) about 30 engineers per year (Fairfield, 1995).

According to Nancy Eissler, board enforcement analyst (written communication), "During Fiscal Year 1994/95 (July 1, 1994 through June 30, 1995), the Board received and opened 243 complaints. During the same period, 232 complaints were closed or referred for

further legal action. Of these 232 complaints, 79 were closed because it was determined that no violation had occurred, 122 were closed without formal disciplinary action being taken, and 31 were referred for further legal action (either the District Attorney's Office or the Office of the Attorney General). The Board currently regulates 86,294 active professional engineering registrations and 3,780 active professional land surveying licenses."

Although these numbers represent snapshots in time, any consistent and reasonable approach to analyzing them will likely yield results comparable to any other consistent and reasonable approach. Using the 232 "closed or referred" complaints for the year as a starting point, and the total licensee population of 90,740, the board's total complaint rate is about 2.6 complaints per 1,000 registrants per year (for the year of record only, of course). Its net enforcement rate [total complaints minus dismissed (closed) complaints] is about 1.7 disciplinary actions per 1,000 licensees for the reported year. The 122 informally closed complaints, which may have been treated by such means as letters of concern, etc. represent an enforcement rate of about 1.3 per 1,000 licensees for the reported year, and the 31 more serious, formally referred complaints represent an enforcement rate for this category of about 0.3 per 1,000 licensees for the reported year. (These calculations are not corrected for the approximately one-third of the board's registrants who do not live in California, most whom presumably do not contribute significantly to the board's workload.)

According to Romano (1995), the California Commission on Teacher Credentialing, which licenses about 250,000 teachers and administrators, had 190 suspensions or revocations of licenses in fiscal 1993-1994. This tells us that the commission had a major disciplinary action rate of about 0.76 actions per 1,000 licensees per year for that 1 year.

Data from a private accreditation organization are comparable. According to the Certified Financial Planner Board of Standards (1995), 1994 data are as follows: membership, 29,532; total cases, 62; cases dismissed, 29; license revocations, 12; lesser actions, 21. For 1994, the dismissal rate was about 53%. Total complaints were about 2.1 per 1,000 certified financial planners, complaints with action taken were about 1.1 per 1,000 certified financial planners, and revocations were about 0.41 per 1,000 certified financial planners. About 41% of the board's cases in 1994 arose from the actions of regulatory organizations, 26% from civil or criminal court data, 18% from professionally pursued complaints, and 11% from "client unhappiness."

Within this small and varied sample population, so far as they can be identified, we see total complaint rates in the range of 2.1 to 2.6 per 1,000 professionals per year, enforcement rates for serious infractions generally in the range of 0.3 to 0.76 actions per 1,000 professionals per year, and dismissal rates in the general range of 34 to 53% of complaints received. While some variations will occur depending on how one wishes to make several judgment calls in setting up an analysis of the data, the reader's results are likely to be reasonably close to mine. A comprehensive study using data from many years and many licensure boards would no doubt yield more reliable data and a few surprises at the extremes. Intuition tells me that the numbers reported here are not likely to be at the extremes nor are they likely to be unreasonable.

Balancing Licensure And Enforcement Programs

If licensure is too restrictive, some minimally competent candidates will be denied a license, but enforcement needs will be low. If licensure is too lenient, more than an acceptable number of less-than-minimally-competent candidates will be authorized to practice, and enforcement efforts will be more extensive and expensive than necessary.

If board enforcement is minimal or nonexistent, competitive pressures will cause substandard levels of practice to grow to the point that the public is harmed. Slosson and Petak (1989) state, "It appears that the level of professional work will drop to the lowest level allowed by government...." With lax board enforcement, costs to taxpayer-supported regulatory

agencies will increase as they become the de facto enforcers, undertaking the board's abandoned enforcement function. If board enforcement is too harsh and intensive, professional practice becomes very conservative, it will result in unnecessarily higher costs to the consumers and the public.

The question of how much licensure is enough is the easier of the two questions to answer. The market, over the long run, demands enough licensed professionals to meet its needs. The candidates who come before a licensure board are responding in part to market forces when they choose to enter the profession. The board provides two filters in the licensure process: evaluation of candidate qualifications to take the examination, and the examination itself. While evaluation of candidate qualifications is not always straightforward, it very rarely becomes a sticking point that cannot be resolved. The validity of the examination can be confirmed and maintained by following appropriate psychometric procedures.

None of the many sources I queried on this issue could cite an accepted and objective way of evaluating or validating a board's enforcement program. They felt that the question of how much enforcement is enough could best be answered by a study of the enforcement programs of several boards similar to the board whose enforcement program we wish to evaluate. Such an evaluation may be a valuable beginning, but it is also subject to error because it assumes that an average of the status quo is a meaningful reference point. Other difficulties with this approach are discussed in the following two sections.

The "culture" of each board and profession is different, as is the political climate in which they operate. A board administering a title act (certification) has far fewer potential grounds for enforcement than does a board administering a practice act (licensure). Score one for practice acts.

Features Of Enforcement Programs

Principles

If an enforcement program is to work well, several principles must be put into effective operation.

(1) A variety of sanctions must be available to the board to fit the variety of circumstances.

(2) Justice must be sure. The board must have the staff and tools it needs to do the job effectively and fairly. This builds confidence in the profession and in the public that standards are being enforced and that there is an avenue of redress. Prosecutorial support must be available, funded, and implemented.

(3) The avenues for reporting substandard practice to the board must be made known to those who can use them. Roadblocks must be removed. This means that the board should reach out affirmatively to all sources of information about substandard practice, and clear the way for those sources to send questionable reports to the board.

(4) The performance standards for the profession must be established and made known to the profession. The board must adopt guidelines or regulations that state what is acceptable performance or practice and how work will be evaluated to determine if it is acceptable.

(5) The most effective enforcement programs are proactive, not passive. All enforcement programs passively accept reports of potentially substandard practice. Nearly all boards are modestly proactive in terms of making consumer information about the board and its enforcement activities readily available. Only a few enforcement programs (and they are the most effective) are proactive in two important ways. First, board or board staff routinely contacts and visits administrators and reviewers in regulatory agencies that review

reports that fall within the purview of the board. This is done to inform the regulators of the board's mission, capabilities, and interests and to establish mutual trust. Second, board investigators undertake independent spot checks of professional reports filed as public documents with regulatory agencies.

(6) The board must be able to investigate and take action against unlicensed practice.

Sources of Enforcement Cases

Although the consumer of professional services is an important source of enforcement information for many occupations and professions, he or she is not usually well equipped to detect enforceable substandard practice in all of its variety. It is the regulatory or permitting agency reviewers of professional reports who are in a prime position to detect and report substandard practice when it really matters: on major cases and when consistent patterns of substandard performance become apparent. Only the regulatory reviewer can detect a pattern of repeated cases of substandard practice because only the regulatory reviewer sees a large number of reports by any one consulting firm. These reviewers are usually employed in a public agency, such as a Building and Safety Department, Health Department, Planning Department, Water Resources Management agency, Solid or Hazardous Waste Management agency, Environmental Management agency, or other regulatory agency.

Only a regulatory reviewer trained and experienced in geology will recognize the following deficiencies in complex or even simple consulting reports (modified from S. N. Hoose, written communication):

- Basic scientific principles ignored •Critical factors not investigated
- Data not analyzed or selectively analyzed
- Data collection incomplete or inappropriate
- Unsupported assumptions ("geoenvironmental folklore")
- Misleading presentation of data
- Lack of conclusions or recommendations.

An effective and aggressive board enforcement program will reach out to those who can recognize and report the greatest number cases and the most significant cases: the regulatory reviewers of professional reports. This goal is so important that perhaps all the design professional licensing boards in one state department should get together and up the ante by asking the department leadership to help them achieve it as a group.

A Major Factor Inhibiting the Reporting' of Potential Cases

If the basic aspects of an enforcement program are present, if the board is committed to and has funding for its enforcement program, and if those regulatory reviewers in a position to detect and report potentially substandard practice are willing to do so, there remains one institutional factor that inhibits enforcement, namely that the regulatory agencies employing reviewers of professional reports do not have policies in place that encourage or require the reporting of potentially substandard practice to the board. This one factor, more than any other, minimizes the reporting of substandard practice by regulatory reviewers.

An effective board enforcement program of necessity would include outreach to the policy level management at agencies that use staff geologists or consultants for regulatory review. The goal would be to convince the agency leaders that they should adopt policies empowering their staff or consultants to send questionable reports to the board with a minimum of agency oversight. This is difficult for a board to do, and difficult for the agency leaders to accept with grace, because obviously we are asking the agency leaders to step closer to the stove in an already hot kitchen. Nonetheless, if the public interest is to be well served, it must be done. (In California only the Toxic Pits Cleanup Act requires referral of substandard geologic reports to the State Board of Registration for Geologists and Geophysicists, such referral being required of the State and Regional

Water Quality Control Boards. Apparently no other law, regulation, or ordinance has this feature.)

One reviewer, who works for a large county in California, told me that he needs the approval and signatures of three layers of management above him to refer a consultant's report to the Board of Registration for case potential evaluation. This is probably typical. Can we expect these three signatures to be obtained as regularly as they should be to serve the public well? No. This is putting in a filter where it is unnecessary.

Reviewers should be able to refer reports to the board on their own volition with impunity and without management approval, because they are not saying a report is substandard when they refer it to the board. The reviewer is simply asking the board staff and experts to determine if the report is substandard, and allowing the board to take action as it wishes.

Perhaps the licensure board should approach the legislature and ask for a law that protects the reviewers and their employers by specifying that the reviewer and the agency cannot be sued or harassed for referring a report to any state licensure board, and allowing them large damages if they can prove such harassment in a civil court. (As long as I am fantasizing, I might as well add "make it easy to prove harassment," too.)

Maybe consultants, project developers and their hired guns, and elected state and local government personnel should not be allowed to contact the reviewer's supervisors (at any level) for the purpose of suggesting that the reviewer is too tough, or not customer friendly. Anecdotally, we know that such contacts happen. We also know they cannot be prohibited effectively because everyone has a right to express her or his opinions to government leaders and employees. Perhaps the reader can solve the problem of how to put fire in the belly of the management of public agencies so they can deflect such attacks and support their reviewing geologists. If public-interest advocates and politicians really want licensure to work as it should work, then politicians at all levels should completely remove themselves from the arena of day-to-day operations of the reviewing geologists (and engineers, surveyors, and architects) insofar as licensure board enforcement referral is concerned.

An additional factor that reduces the number of referrals of poor reports to a licensure board is that many jurisdictions receiving geological reports mandated by law do not employ as staff or on a consulting basis professionals qualified by licensure and experience to undertake the review of reports submitted by licensed professionals. California-based consulting geologist Michael Hoover related (personal communication) that he and his colleagues find themselves frustrated by having their professional reports on groundwater contamination problems reviewed by nongeologists in regulatory positions. When reviewers have no appreciation of the significance of the report they are reviewing, they will let shoddy work slip through (and not refer a report to a licensure board), demand unnecessary work, or ignore the report's recommendations when they issue or condition a permit or closure. In the California legislature, Senate Bill 914 (Alquist) of 1995 attempted to remedy this situation, but was taken off the calendar.

Evaluating Enforcement Programs By Comparison Among Boards

Comparison Among Boards Licensing Different Professions

Do the grounds for disciplinary action vary significantly among different professions? The Ad Hoc Task Force on Regulatory Issues (1995) provides "universal" grounds, as well as separate lists of grounds, for health care and non-health care occupations and professions. This publication is a valuable beginning, but not all boards can enforce on the basis of all the grounds listed, and the variety of grounds will change in the future. For example, some licensed professionals are subject to a report review process that holds enforcement potential unique to their group: regulatory review by peers.

Care should be taken in comparing disciplinary performance and goals among boards licensing different professions. For

example, initially one might place geologists in the category of design professionals and seek to compare the performance of a geology board with boards licensing other design professionals, such as engineers, architects, and surveyors.

One could not hope for more than order-of-magnitude comparability in researching the performance of a design professional board with that of a board licensing a trade (barbers or auto mechanics) or a board licensing medical or financial professionals or teachers. The legal, ethical, and professional relationships and the opportunities for and consequences of malpractice between the licensee and the customer or client vary significantly.

In comparing enforcement programs of boards that fall into a logically related group, such as boards licensing design professionals, we must first ask if these boards have similar bases of enforcement. That is, do the professionals licensed by each board have similar responsibilities imposed on them by statute, case law, code, or ordinance? If one profession has more tangles of hoops to jump through than another, this would suggest that more trip wires would be tripped, and hence more enforcement would result, assuming equally vigilant enforcement programs.

Another factor in comparing enforcement programs is the training of and methodology practiced by the licensed professionals. These factors bear on the way the work is done and they bear on the vagueness, number, and severity of adverse effects of the residual unknowns that lurk in the investigative and analytical processes used by each profession. The differing methodologies will result in work products subject to different sets of potential problems, and ultimately to different sets and rates of charges of improper practice. This, in turn, will lead to different results and goals in enforcement programs that are equally vigilant.

Geologists, for example, are trained as scientists and are specifically trained to make use of inductive reasoning, as well as inference drawn from the careful accumulation and examination of large amounts of detailed data (among other things, of course). Residual unknowns are plentiful and are often not well constrained. By the nature of their science and practice, geologists must rely on inductive reasoning far more than other design professionals. The issue of professional judgment is, I think, more likely to arise in enforcing a geologist licensure act than in enforcing the licensure acts of other design professionals. Indeed, these factors should justify specialized training for enforcement officers dealing with geologic practice.

It would be perilous to assume that because geologists, architects, and engineers are all design professionals the results of equally vigilant enforcement programs by their three respective boards should be the same in terms of rate of each possible type of enforcement action per 1,000 registrants. Of course, some rough comparability of enforcement rates might be expected, but it would not be surprising to find enforcement rates varying by large factors and still be supportable for each board.

Comparison Among Boards Licensing the Same Profession

A further difficulty arises in comparing boards licensing the same profession in different states. Once again, we must first ask whether the licensure programs comparable, and we must next ask whether these boards have similar bases of enforcement. That is, do the professionals licensed by each board have similar responsibilities imposed on them by statute, case law, code, or ordinance? Some boards have independent enforcement powers and staff, others have no enforcement staff and rely on investigators from their parent agency. In either case, the board might be hampered by lack of a suitable array of enforcement options. A board administering a title act has far fewer enforcement opportunities and options than does a board administering a practice act. (Score one for practice acts.)

Another aspect of the basis of enforcement concept is this. In only a few states that license

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geologists are several types of geologic reports required by statute, code, or ordinance. This type of report is subject to scrutiny by professional reviewers and is also available as a public document for inspection by a board investigator. This body of reports might be the source of a fair number of complaints if it exists, if there are no meaningful institutional constraints on the reviewer sending problematic reports to the board for evaluation, and if the board is fortunate enough to have trained investigators who have the authority to perform independent checks of reports on file at reviewing and regulatory agencies.

Without a study of these and other relevant factors, it would be inappropriate to assume that if the geology board in state A has an annual complaint rate of 5 per 1,000 licensees, then a geology board in state B should have the same or similar rate. Without careful comparison of the disciplinary options available to all boards, as well as the effectiveness of implementing disciplinary options in view of each board's budgetary and political position, it would be inappropriate to assume that if a board in state C issues 20 reprimands per 1,000 registrants per year, implements 10 fines per 1,000 registrants per year, and revokes 1 license per 5,000 registrants per year, then a board in state 13 should be doing the same.

Current Status Of Geology Board Enforcement

Enforcement activities by almost all geology licensure boards in recent years can be most charitably characterized as lacking in commitment, authorization, support, and funding. This is not particularly the fault of the boards, but is a result of poorly drafted enabling legislation, cumbersome state budgeting systems, and lack of support from professional associations that should be concerned about professional practice standards. Throughout their history, engineering boards have faced a suite of enforcement frustrations documented by Curtis (1988) that geology boards will find all too familiar.

Many public agency reviewing geologists, already noted as a prime potential source of enforcement cases, have become very discouraged from the perceived lack of enforcement interest or capability by a board. They desperately need convincing that the board will seriously consider potential cases and institute discipline when justified.

One of the major goals of the team of geologists (I was one of them) that crafted the Suggested Geologists Practice Act was to give the board created by that act the full range of enforcement powers we thought it needed. The reason broad enforcement powers are needed is simple and arises from the major defect in most older enabling legislation. If a board is authorized only to undertake enforcement at a level that is catastrophic to licensees (license revocation for major malpractice), a variety of lesser infractions will be allowed to flourish that, taken in sum, are likely to be a greater evil than the occasional gross negligence case. Given the power to rap a few knuckles every year, a board can get its enforcement message across in a cost-effective way that deters gross malpractice. Therein lies significant cost savings for the board, the public, and, ultimately, for the licensed professionals.

When I talked to board staff or members, with one exception all those interviewed felt that their enforcement program was less than it could and should be. Common to almost all boards were the following typical reasons for low enforcement rates. Not all persons interviewed mentioned all the reasons, but all of them mentioned several from this list. All of the people I spoke with started with a statement along the lines of "The board wants to do more enforcement (or recognizes that more enforcement is probably justified), but...," and ended the statement with the following reasons:

(1) We don't have enough funding to do it, and the state budgeting process effectively prevents us from getting adequate funding,

(2) We have to rely on our parent/umbrella agency for enforcement implementation, and they have other priorities,
(3) When we do take a case to completion, we have to turn it over to the state attorney general's office or a local district attorney, and they put a low priority on it,
(4) The state attorney general's office has high billing rates back to us, and we can't afford them,
(5) There are not enough options or levels of enforcement in our act, or
(6) The license fees we collect go into the general fund, and we can't get enough of them budgeted back to us to implement enforcement/

Plainly, the system hamstrings the enforcement efforts of many boards from the beginning, regardless of their good intentions. There are newly created boards that, of course, will have no disciplinary case load until practice activity starts producing it.

Board Actions That Regulatory Geologists Want In Support Of Their Participation In Enforcement

In general, the views of the California regulatory (reviewing) geologists are meaningful for geology licensure boards nationwide. Although these views are more broadly applicable if a board operates in a state that has significant laws and regulations that require geologic reports subject to the review of regulatory geologists, they also provide conceptual guidance in the absence of such requirements. The reviewing geologists I interviewed all strongly supported the following actions by a licensure board.

(1) Promulgate practice standards and guidelines. These should be standards a reviewer can cite. This eliminates the argument made by consultants to the reviewer, in the absence of citable standards, that "my license is as good as your license." The reviewer needs written, citable, board-approved standards rather than personal opinion to support his or her demands for additional or higher quality work.
(2) Make a statement on the powers the reviewers should have. For example, trench logs in a report give only one interpretation of the observed conditions. The reviewers should be able to request and receive the opportunity to meet with the consultant in the field so everybody sees the same trench open at the same time, can agree or disagree on the significance of the observed conditions, and can engage in critically important dialog in the field.
(3) Reviewers, whether consultants or staff, should be empowered to send questionable reports to the board for case evaluation on their own initiative and without approval of higher authority. Board outreach to the leadership of regulatory and permitting agencies will be necessary to accomplish this goal.
(4) Discourage the use of more than two consultants as reviewers by a jurisdiction on a rotating basis. Using a larger rotating list leads to inconsistency in review standards from time to time. It also leads to exacerbation of personality and style conflicts in which two or more consultants review each other's reports, with resulting escalation of stringency of review.

Regulatory geologists look to the licensure boards for leadership, guidance, and support in these areas. Licensure boards and their outreach programs are surely an essential part of the reviewing geologists' support structure. Without proactive outreach on the part of the board, and without visible, publicized, results of board enforcement the regulatory geologists feel like orphans and are unlikely to do what they alone can do best in a systematic and consistent way to help board enforcement: call possible cases to the attention of the board's staff. Fortunately, boards are waking up to their outreach responsibilities. Current efforts by the California Board may make it a leader in improving board outreach.

Benefits Of An Effective Enforcement Program

Enforcement and licensure programs, each optimized to the other, protect the public from harm caused by substandard practice. Critics of board enforcement focus on this issue and have yet to discover a more significant issue: enforcement offers some very real and large benefits that go beyond protecting the public from immediate or latent harm.

A good enforcement program will raise the standard of practice and result in higher quality reports being submitted to taxpayer funded regulatory agencies for review. Reviewing a major report (and there are thousands of them every year) often includes extensive conferences about the scope of work, the implications of the analyses in the report, the suitability of the work to support the report's conclusions and recommendations, and the applicability and suitability of the recommendations in light of goals given in statutes, codes, or regulations. All of this costs time and money for the taxpayer supported reviewing agency, the professional who wrote the report, and the client. The savings in time and dollars to all concerned, especially to the taxpayer funded regulatory agency, will be substantial. Agency workload will be reduced because reports will no longer circulate several times from consultant to owner to agency and back to consultant, owner, and agency again for more review.

In a state with extensive regulatory review of professional geologic reports, the savings in public agency employee time that would result from an effective board enforcement program would likely be several times the board's annual budget.

Groundwater pollution cleanup is often delayed while substandard reports are brought up to standard through public agency review. Time is of the essence in many groundwater cleanup projects. The longer the wait before cleanup starts, the bigger the contaminated volume becomes and the more difficult and expensive the cleanup. If enforcement results in higher quality work and fewer delays in cleanup programs, the aggregate cost savings to responsible parties can be in the millions of dollars annually. If the public is paying for the cleanup through default of responsible parties, the millions saved are taxpayer dollars.

Safeguards For The Practitioner

Practitioners will worry about the fairness of a licensure board's enforcement program. One safeguard is the monitoring of all of the board's activities by professional associations. All states have something equivalent to an administrative code that specifies the criteria and procedures a board must follow in its enforcement activities. Training for board staff in enforcement operations is available from CLEAR (Council on Licensure, Enforcement, and Regulation), and such training should be supported (demanded) by professionals and their associations. Board enforcement should be targeted to compliance with board statutes and guidelines and conformance to the standard of care.

Generally, enforcement should have the goal of encouraging an increase in competence by those professionals who face enforcement proceedings. If this is done, then professionals will get the message early on and, as a result, only rarely will it be necessary for the board to revoke a license.

Conclusions

The questions how much enforcement is enough and how to know when we have enough enforcement are impossible to answer on the basis of recent experience or objective studies. Some level of enforcement is clearly appropriate. For many reasons, and not necessarily through their own lack of interest or dedication, geology licensure boards are hampered in implementing fair and effective enforcement programs.

Although enforcement action rates will likely be very modest under even an aggressive enforcement program, the payoffs will be large for the public, and protecting the public is what licensure and enforcement should do. Aggressive and fair enforcement benefits the profession and the public by making it clear that avenues of redress exist under the board's act, and that substandard practice will not be tolerated. An aggressive and fair enforcement program will probably save the taxpaying public

much more money than the board's annual budget because of the cost savings of improved practice to the regulatory community and to the clients who will pay less for professional work done right the first time.

Responsible, fair, enforcement of licensure laws doesn't cost. It pays.

Table 20-1. Summary Of Interviews With Geology Boards From Seven States On Their Enforcement Programs

State Number 1. Board has been licensing geologists for about 10 years. Recognizes need for enforcement. Has no outreach program. Diligently investigates complaints, which come in at a low rate of a few a year. About two-thirds of complaints come from regulatory agencies, and one-third of the complaints come from public and other sources. Most of the other source complaints are consultants notifying board of unlicensed practice. No licenses revoked in history of board. Discipline consists of writing letters of concern or (in essence) cease and desist. Often, board will bring parties together informally and act as a participatory mediator to bring about a solution to questionable practice, thus obviating need for discipline.

State Number 2. Board (in existence about 18 years) has never revoked a license, and no disciplinary actions have been taken against licensed geologists because no complaints have been received against licensed geologists since the board's inception. A few complaints of unlicensed practice have been received. Political climate suggests that enforcement is not a high priority. Legislature's tendency is to license a profession, but not fund a board fully and thereby establish control on what it is feared might be runaway boards, that is, a board dominated by the profession it licenses. There is an implied concept that civil litigation between aggrieved client and the professional is capable of acting as an enforcement substitute.

State Number 3. Board has been in existence for about 7 years. Has very low enforcement funding, and therefore tends to hope things work out. Has no outreach program.

State Number 4. Board has been licensing geologists for about 16 years. Has had very few complaints about geologic practice. Generally little geologic work comes under regulatory review, which is the main reason for low enforcement rates. Has no outreach program.

State Number 5. Has had two cases in the last 5 years, none or very few before that. One case was cheating on the exam; a license was not issued. The other case involved use of privileged information for personal advantage. License was revoked after court proceedings, including appeals by registrant to higher courts.

State Number 6. Board has been licensing geologists for about 5 years. Board has no enforcement authority because the legislature assigned enforcement authority to the umbrella department in which the board resides. The rationale for this was that the legislature believed that only a very few hundred geologists would be licensed in the state, and felt it was more efficient to assign enforcement to the umbrella agency. The board now has about 1,500 licensees, and many licensees and the members of the public who have complaints are upset with the lack of enforcement. The board is seeking a sponsor for a bill that would give it independent enforcement authority.

State Number 7. Board has been licensing geologists for over 30 years. A principal enforcement drawback, the fact that the board had no authority to take action against unlicensed practitioners, has been remedied by recent legislation. This board has an aggressive enforcement program. It licenses several professions (including geologists), and one trade. In

the last 12 years, the complaint rate against geologists has been zero. In the same time, there have been "a couple or reports of unlicensed geologic practice. The basic reason for the low complaint rate against geologists is that although engineering (including groundwater and environmental) geology is widely practiced in the state, there are few, if any, statutory or code requirements for geologic reports. Hence, no cases arise where a client is told by a public agency reviewer that a report needs more work, which might cause the client to wonder if the report is negligent and file a complaint with the board. An additional aspect of the low complaint rate is that, with respect to economic geology practice, the client base consists of sophisticated owners who understand what they want and are able to write strong contracts with their consulting geologists. These clients get what they want.

This board registers a total of about 20,000 persons. About 700 are geologists, a few hundred are in the registered trade, and the remainder are in design professions. Complaint and discipline statistics are approximately as follows. The board receives about 250 complaints a year, which are about equally split between unlicensed practice complaints and complaints against licensees. The complaints against licensees are investigated, and in a typical year the board takes disciplinary action against about 70 to 75 licensees. That is, about 55 to 60% of the cases investigated by the board's staff result in disciplinary action items eventually coming to the board. Of these disciplinary actions, typically about 2 or 3 a year are license revocations.

The board has an aggressive enforcement program that includes outreach. Once a month a board investigator hits the road and spends a week talking to building officials in their offices across the state. The investigator brings information about the board's work and practice expectations to the building officials. The investigator will review any reports the building official has received if the building official so requests. The investigator then performs an independent spot check of reports on file that the building official has received recently. Any suspect reports are copied and brought back to the board office for further evaluation. A good portion of the board's case load is derived from these independent spot checks

Chapter 21

Miscellaneous Myths And Common Challenges

Introduction

This chapter reviews some miscellaneous myths and common challenges prevalent in discussions about professional licensure for geologists. Some of the myths are believed by those who regulate a profession, some by economists and social scientists, some by opponents of registration, and some by adherents of registration. References to other chapters in this book are made where supplemental information can be found. Additional fallacies, myths, and challenges are discussed in Hoose and Tepel (1990).

Myths And Challenges

1. Regulation or licensing is always promoted by the profession to be licensed, never by the public; therefore, obviously the professions promote regulation only in their own selfish self-interest.

If you look carefully at this claim, it is actually a very big leap from assertion to conclusion. It is an overgeneralization to claim that all professional associations have always supported licensure. In many cases they have reluctantly come to accept it.

The public does not request professional licensure because, barring a catastrophe or intensive publicity, professional practice is not a critical issue in the daily concerns of almost all members of the public and their political representatives (Slosson and Hauge, 1973; Scullin, 1992). This does not mean that the public, if asked, would not support professional licensure. For example, the International Association for Financial Planning commissioned a Gallup Poll about financial planning. When asked, 76% of those who thought professional advice was beneficial also thought that "...the government should regulate financial planners." Furthermore, "Only 27% of the public felt that financial planners were being properly regulated by their own profession." (Financial Planning, 1990). Curtis (1988) reports the results of a survey of large employers of engineers about the value of registration (licensure). An overwhelming majority of the employers believed that registration was advantageous to the public.

A disaster can cause public pressure for professional licensure. In Texas (in the 1930s), an explosion from accumulated natural gas at New London school led to licensure for engineers (Mathewson, 1990). In California, the St. Francis dam failure that started late at night on March 12, 1928 (Jansen, 1980), resulted in legislation that brought dams under the jurisdiction of the state (Jansen, 1980; Outland, 1963). This dam failure is generally thought to be an important factor in bringing about licensure for engineers in California (Donald Babbitt and J. David Rogers, personal communications). The Long Beach, California, earthquake of 1933 brought about California's Field Act requiring special engineering attention to the design of public schools and is generally thought to have led to specialty licensure for structural engineers in California (J. David Rogers, personal communication).

Curtis (1988) documents the history of licensure for engineers and the history of the National Council of Engineering Examiners (NCEE, predecessor to NCEES). His chronicle reveals an uncanny developmental parallelism shared by the licensure movements in engineering and geology. Geologists who oppose licensure are mimicking some of the early antilicensure rationale voiced by engineers.

The American Society of Civil Engineers was officially opposed to licensure from the first proposed licensure act for engineers in 1897 until 1935 (Prasuhn, 1995). The arguments among engineers reported in an early magazine article reporting a vote against registration for engineers by the San Francisco Section of the American Society of Mechanical Engineers (Engineering News Record, 1929) read remarkably like the arguments geologists have had about licensure.

The opposition to licensure for geologists by the American Institute of Professional Geologists (AIPG) from its formative days until the present time is well known in the profession. Slayback (1988) references antilicensure policies adopted by AIPG in 1987. AIPG's current policy on professional licensure states that peer certification "is to be preferred as the most effective available means to protect the public health, safety, and welfare" (American Institute of Professional Geologists, 1993).

Galster (1982) records the sometimes turbulent history of licensure discussions within the Association of Engineering Geologists. Gardner (1982) reports that at the meeting on June 3, 1957, at which the decision was made to form a "California Association of Engineering Geologists," one of the issues to be studied was "...the need for and means of obtaining State registration of engineering geologists." From then until about a decade later, the Association's Board of Directors had many discussions about the desirability of professional licensure before finally committing to it.

If the power, image, monetary, turf, and stature benefits of licensure to a profession were as bountiful as they are imagined to be by some social scientists and public interest advocates, one would expect professional associations to endorse licensure universally and with alacrity, but they do not. Given the documented hesitation of some professional associations to endorse licensure, and the outright opposition to licensure expressed by others, the only reasonable response to the charge is that if licensure brings any power, image, monetary, turf, and stature benefits to the profession or its associations, they must be slight indeed on balance.

2. Licensure leads to reduced competition and increased costs to the consumer. The free market will adequately protect the consumer by forcing the incompetent professionals out of business. Geologists who provide quality work will cultivate a positive reputation, and those who do not will be eliminated from the marketplace.

This is a concept that probably cannot be proven to work or not work in practice. I have seen no evidence that the market routinely, efficiently, and directly transmits, in useful quantities, information about poor practitioners from those they have deceived to those they intend to deceive.

I've never heard geologists talking about how easy it is to make money because there is no competition, with or without licensure. I have often heard them talking about the tough, competitive world they live in, with or without licensure. The market is a far bigger force than licensure. The market is big enough that incompetents can always find niches in which to practice, and they can move on to other practices or geographic niches when the going gets tough.

Scullin (1992), Slosson and Hauge (1973), and Shuirman and Slosson (1992) provide comments indicating that competition can lead to reduced standards of professional work, and that Slosson's Law—"the quality of professional work will sink to the lowest level that government will accept" (Shuirman and Slosson, 1992)—applies in many cases. Scullin (1992), writing as a regulatory geologist, calls for additional enforcement effort by a licensure board. Licensure, by promulgating enforceable practice standards, counters the competitive pressures of the market that lead to a lowering of standards.

3. Licensure just creates another layer of unnecessary state bureaucracy. Licensure creates a faceless, unresponsive, bureaucracy.

The layers, in fact, already exist because many professions are licensed in every state; therefore licensure does not create

another layer of bureaucracy, but fits quite nicely in existing layers.

Although I am sure that occasionally communications get lost in the cracks, boards and their staffs in my experience are responsive. Far from being faceless, boards these days almost beg the professions and the registrants to pay attention and give them input; many boards have public comment periods on their meeting agendas, and the public and the professionals are invited to attend meetings and participate. Go to a meeting and you can go to lunch with board members.

Board members are available outside of board meetings. At a recent professional association dinner meeting, one of the geologists at my table was complaining about the way his examination was scored. He wondered how he could get the attention of someone in the "faceless bureaucracy" to register his gripes. The man across from him said, in essence, "Well, I'm chairman of the board's Professional Affairs Committee, next to me is the chairman of the board's Examination Committee, and next to him is a member of the board, and we are all willing to listen to you here and now." Faceless bureaucracy? Hardly.

4. A definition statute or, at most, a title act, will protect the public adequately.

Title acts are currently inadvisable due to the Abramson court decision (see Chapter 6). Definition statutes are toothless and provide only a minor avenue of pursuit of improper practice through the civil courts. The only practical licensure law is a practice act.

While board enforcement can sometimes be cumbersome, it is certainly far less cumbersome and offers quicker resolution of problems than do the civil courts. Board discipline can cover a wider range of matters than are practical for the civil courts, with their overcrowded calendars, to take under their wing. Board discipline gets the message about practice standards out to the profession far more effectively than do court cases.

5. Licensure is redundant to the process of employee evaluation by employers.

Licensure isn't really targeted toward protecting employers as such, but is targeted toward protecting the public by assuring that geologists hired as employees are properly qualified when they practice before the public in the course of their work for their employers. There is no reason to assume that all employers who hire geologists have the expertise to evaluate the qualifications and work of their geologists; a great many simply do not. Of course, many geologists employed in industry do not practice before the public, hence the "industry exemption" in licensure laws.

6. Licensure is just another form of taxation.

Licensure is basically a "fee for service" type of governmental program. Licensure fees are not taxes. They are, however, tax deductible to the extent permitted by law.

7. You can pass a licensure test and still do poor work.

Yes. That's why licensure boards should have good enforcement programs. (You can be certified by a professional association or graduated from an accredited curriculum and still do poor work, too.)

8. Licensure does not eliminate fraud and scams.

Of course not, but it does provide another nail in the coffin through enforcement, and gives the public a place to press charges other than the overcrowded civil courts.

9. Licensure promotes incompetence because once the incompetents have a stamp of approval, they can practice forever.

I certainly hope you would help ease the incompetent geologists out of business by sending some examples of his or her work to the board and requesting that the individual be evaluated for case potential. If you don't want the incompetent to be licensed in the

first place, then volunteer to be a subject matter expert and help write and grade the examination. Licensure will work the way you want it to work if you take responsibility for making it work.

10. The public health, safety, and welfare is not justification for licensure because complaints can all be handled as civil court cases.

A licensure board can handle complaints far more efficiently and timely and at far less cost to the public (and the professionals involved) than can the courts. Given bulging court calendars and the expense of pursuing litigation, a licensure board would be able to address many complaints that are too small for the citizens to take to court. The licensure board can get the attention of substandard practitioners and improve the quality of their practice by measured, incremental sanctions.

The existence of a licensure board does not, of course, preclude civil action by complainants. The licensure board can require restitution, such as ordering the work to be redone at no or reduced cost, require remedial education, and take other routine actions that the courts almost never consider.

Licensure boards can take helpful action on cases that the typical consumer would be hard-pressed to find of interest to an attorney. The licensure board can also publicize its enforcement actions through a newsletter or annual report to licensees and thereby efficiently notify the profession of the current practice difficulties. This will certainly lead to improvement in professional practice, something that will not happen if we rely on courts as the only avenue of redress. Minor court cases just don't get much publicity in the profession.

11. Licensure really should only be concerned about "little guy" consumer of professional services. The big corporations have the expertise to take care of themselves.

Although some big corporations have or are developing in-house expertise in areas of geologic practice that impact the public health, safety, and welfare, other corporations do not. A prime example is in the retail petroleum industry, where most major companies are hiring consultants for groundwater contamination problems at their gas stations. Some large companies manage their consultants through staff geologists who are experienced in soils and groundwater contamination, some do not. Reports from my colleagues in the regulatory field suggest that many large corporations lack the sophistication to select competent consultants in this area of geologic practice. Some large corporations, strange but true, are just as much babes in the woods as are the owners of an independent "Mom and Pop" gas station when it comes to retaining geologic consultants for soil and groundwater contamination work. Both the large corporation and the "Mom and Pop" operation need the basic filter provided by licensure when they look for a consultant.

12. Licensure (registration) kills professionalism. If you are registered, you are no longer a professional.

There must be tens of thousands of registered engineers, licensed architects, Certified Public Accountants, and other licensed professionals who would disagree with this thesis. In the books edited by Johnson (1989), Tepel (1990), and Hoose (1993), the great majority of the authors 61 papers, representing professional associations or their own views, reject, discard, or give no recognition to this myth (see also Chapter 6, under the heading "Is Professional Licensure Unprofessional?").

This is a favorite charge of a very few of the geologists and geophysicists who are adamantly opposed to licensure of their professions. A commonly offered follow-up is that the profession can regulate itself through professional associations. I tend to view these assertions as examples of emotional responses to the concept of licensure that indicate we have some distance to go before all but a few in our profession are comfortable with the concept of licensure.

Slow acceptance of licensure as an integral part of a profession is a normal

process as a profession matures and comes to grips with the facts of professional life. Parker (1990) says, "History tells us that the evolution of professional registration is a slow and, yes, sometimes painful process." The challenges to licensure that arise within our profession are typical of those that arise in other professions in the early stages of licensure implementation. According to Prasuhn (1995), the American Society of Civil Engineers opposed registration for civil engineers from 1897, when it was initially proposed, to 1935, even though ASCE adopted a "model law" for registration of civil engineers in 1911. This opposition was based on thoughts such as "ASCE membership alone, was adequate to ensure technical competency and safeguard the public" (Prasuhn, 1995).

Eventually, licensure is regarded as supporting the recognition of the licensed practice as a profession both within the profession and among the public. Curtis (1988) quotes T. Keith Legare, executive secretary of the National Council of Examiners in Engineering, from a 1948 report: "...we no longer have to read articles or listen to addresses by those who never really understood the true purpose and value of registration." Licensure comes when a large majority of the members of a profession are comfortable with it. Licensure comes when a profession is mature enough to accept it.

13. Public members on a board of registration serve no useful purpose. They just politicize the board and inhibit its dedication to professional regulation matters.

Public members are there to represent the public.

Thomas M. Stout (written communication) suggests that, "Their purpose is to keep watch on the professionals, report any hanky-panky to higher authority, and combat the perception that the foxes are guarding the chicken coop."

Just because they are political appointees does prevent public members from making meaningful contributions. If they are competent, dedicated people (and those I have recently met are), they provide an excellent sounding board (reality check) for the professional members of the board and its committees. They can bring their own expertise to bear on problems of board activities and administration. Their expertise is likely to be in areas that the professional members lack, but the board sorely needs.

Slow acceptance of licensure...is a normal process as a profession matures and comes to grips with the facts of professional life.

A public member who is a teacher can have excellent insights on the examination process even if they cannot concoct examination questions. A public member who is a lawyer can be the chief wordsmith in developing board policies and regulations, and offer sage advice about handling sensitive matters. A public member with accounting or business experience can learn the board's funding system, explain it to the professional members, and help to develop rational and secure funding for the board. Not many professional members would be interested in that chore, important as it is.

Many public members are there because they are or have been active in politics. The board is a political body in a political environment. (That's not a negative, it's just a fact of life in licensure.) To do its job and to survive and prosper in the political environment, the board needs the political contacts and the political thinking and political advice and insight of the public members, as well as their expertise in their chosen fields of endeavor.

Rather than moaning about the supposed uselessness of public members, professionals should get to know them, appreciate their talents and dedication, educate them about the profession, and help the board take advantage of their expertise.

Let's face it: being a public member on a licensure board is not a high-paying job. Just as with professional board members,

you end up putting in three times the number of hours you signed up for, and paying more than a few dollars out of pocket that somehow never get reimbursed. The position is not a prime stepping stone to political stardom. My experience is that public members are there because they want to make a contribution, not because they are on an ego trip.

14. To promote efficient service and fast discipline, autonomy of licensure boards should be reduced so they become merely advisory bodies, and there should be an enforcement "czar" who can mete out discipline rapidly.

This is an old issue that has recently resurfaced. Curtis (1988) records the matter as arising in the mid-1960s in the engineering arena. He even reports the use of the appellation "czar," which is also used by modern protagonists.

Efficient discipline is an attractive goal. Experience to date indicates that the boards are efficient in administering discipline, but that delays are introduced by the legal system that guarantees due process to the accused. The introduction of "cite and fine" authority for licensure boards should adequately address the need for more efficient, quicker, resolution, of minor cases. As noted, these are important cases because they are the cases that carry the board's message to the profession, not the rare license revocation cases.

Reducing the autonomy of boards by making them policy advisory committees will ultimately result in a more obscure and impenetrable bureaucracy than we have now with semiautonomous boards. Inevitably, the bureaucrat or "czar" will make his or her job easier by not calling on the boards for assistance, reducing information flow to them, thus reducing knowledgeable professional input and judgment in the administration of licensure laws. Members of the professions will not be able to have meaningful access to the administrator who wields the power. If the profession suffers in this respect, ultimately the public will suffer, too. The geology profession, and many others, I am sure, have not abused their relationships with their licensure boards. Thus, there is no demonstrated need to reduce the power of the boards, which are at most semiautonomous now.

15. Once licensure is established, everybody can relax and let the licensure board do its job.

The biggest myth of all, believed by many supporters of licensure and many who are lukewarm about it. The professional associations and the boards buffer each other as they each pursue their unique, and sometimes conflicting, missions. They are each other's conscience. If members of the profession and their associations want licensure to work, they must help the board when it needs help, and critique it when it needs criticism. All parties, most importantly the public, will benefit if professionals and their associations meet their obligation to make licensure work the way it should: to benefit the public without unduly hamstringing the profession.

Appendix 1

Glossary

This glossary provides definitions of the less familiar words, phrases, jargon, and acronyms used in this book. The definitions are generally informal and many are limited to the context of their use in this book.

AAPG: American Association of Petroleum Geologists.

AASG: Association of American State Geologists.

ABILITY: In the context of employment testing, and probably at least partly applicable to licensure testing, ability is "A present competence to perform an observable behavior or a behavior which results in an observable product" (29 C.F.R. 1607.16).

AEG: Association of Engineering Geologists. AIPG: American Institute of Professional Geologists.

ASCE: American Society of Civil Engineers.

ANGOFF METHOD: A method of implementing criterion-referenced scoring procedures for licensure examinations. See Angoff (1984) and Warner (1986).

ASBOG: National Association of State Boards of Geology (formerly called Association of State Boards of Geology, it retained the acronym of ASBOG after adding the word "National" to its name).

CERTIFICATION, CERTIFIED: 1. A statutory licensure process offered under a title act. 2. The process of peer review of qualifications by a professional association, and the issuance of a certificate attesting to the standing of the person reviewed. Sometimes called peer certification to distinguish it from statute-based certification.

The term "certification" has two principal meanings in the context of this book. They are in conflict. There is the peer certification offered by many professional societies or associations, attesting to the standing of their members. While some of the certifying associations rigorously evaluate the credentials of potential members, and may even formally test them, others depart from those standards in varying degrees. Rarely will an examination given by a professional association meet the standards of the National Organization for Competency Assurance, whereas generally an examination given by a statutory Board of Registration will meet those standards or the intent behind them: Statutory certification (title protection) does not always require that licensure candidates pass a written examination. It might rely solely on evaluation and verification of credentials. The term "certification" is also used to describe the process of supplemental licensing in the form of title protection of a specialty. For example, in California at this time one must first become a registered geologist before being eligible to become a certified engineering geologist or certified hydrogeologist. Statutory use of the term "certification" generally means that the statute is a title law or statute (see also TITLE LAW).

CFR, C.F.R.: Code of Federal Regulations. CLEAR: Council on Licensure, Enforcement, and Regulation.

COGNITIVE: Said of an examination question or item that requires mental processing beyond factual recall.

COMITY: Granting of licensure in one state on the basis of the equivalency of the licensure process and standards in another state.

CONSTRUCTED-RESPONSE ITEM: A (generally) cognitive examination item that requires the candidate to provide an answer without having a list of options (possible answers) available. Often called a free-response item.

CONSTRUCT VALIDITY: Demonstrated by data showing that the content of a selection procedure measures the degree to which candidates have identifiable characteristics that have been determined to be important for successful job performance (29 C.F.R. 1607.16).

CONTENT VALIDITY: Demonstrated by data showing that the content of a selection procedure is representative of important aspects of performance on the job (29 C.F.R. 1607.16).

CoPGO: Council of Professional Geological Organizations. An informal group of geologists representing the Division of Professional Affairs of the American Association of Petroleum Geologists, the American Institute of Professional Geologists, the Association of Engineering Geologists, the Society of Independent Professional Earth Scientists, and the Association of American State Geologists, that wrote the Suggested Geologists Practice Act (Council of Professional Geological Organizations, 1993).

CRITERION-RELATED VALIDITY: Demonstrated by empirical data showing that the selection procedure is predictive of or significantly correlated with important elements of work behavior (29 C.F.R. 1607.16).

CRITERION-REFERENCED SCORING METHOD: A scoring method that takes into account the difficulty of each item based on evaluations by Subject Matter Experts. Sometimes referred to as the Angoff Method, after William H. Angoff (see Angoff, 1984).

CUT-OFF SCORE, CUTTING SCORE: See PASSING SCORE.

DEFINITION STATUTE (OR ACT): A statute defining a scope of practice, and possibly basic qualifications of practitioners. Commonly, there is no board or office specifically charged with administering the act. In its simpler forms, a definition act offers essentially no useful regulation of the profession.

DISTRACTER (also spelled DISTRACTOR): Any option for a multiple-choice examination item that is not the key. Sometimes called a "foil."

ENGINEERING GEOLOGY: The application of geologic knowledge, data, techniques, and principles to the study of either naturally occurring rock and soil materials or fluids, or the interaction in the geologic environment of manmade materials and fluids with themselves and with naturally occurring rock, soil materials, and fluids so that geologic factors affecting the planning, design, operation, and maintenance of civil engineering works and the development, protection, and remediation of groundwater resources are recognized, adequately interpreted, and presented for use in civil engineering practice (Association of Engineering Geologists).

ENTRY LEVEL: In the context of professional licensure, entry level means being qualified to take a licensure examination. If the examination is split and parts can be taken at different times, entry level means being qualified to take the final part of the examination. Entry level for examination purposes requires a few (usually about 5) years of postbaccalaureate professional experience.

FIXED PASSING SCORE SCORING METHOD: The passing score is fixed (usually at about 70%) regardless of difficulty of the exam.

FREE-RESPONSE ITEM: See CONSTRUCTED-RESPONSE ITEM.

GEOLOGIST-IN-TRAINING: As used in some licensure statutes, a graduate of an approved geology curriculum who has passed the first part of the licensure examination.

GEOLOGY: Geology is the science that includes the treatment of the earth and its origin and history, in general; the investigation of the earth's crust and interior and the solids and fluids, including all the surface and underground waters, and gases that compose the earth; the study of the natural agents, forces, and processes that cause changes in the earth; and the use of this knowledge of the earth and its solids, fluids, and gases and their collective properties and processes, for the benefit of mankind.

GRANDFATHERING: The customary practice in licensure acts that permits, for a limited time, highly experienced practitioners to become licensed without examination if they meet all the other criteria.

ITEM: A question to be answered, problem to be solved, essay to be written, or sentence to be completed on an examination.

ITEM BANK: The total number of items available to draw upon to create an examination.

JOB ANALYSIS: A detailed statement of work behaviors and other information relevant to a job (29 C.F.R. 1607.16).

JOB DESCRIPTION: A general statement of job duties and responsibilities (29 C.F.R. 1607.16).

JOB TASK ANALYSIS: An analysis of a list of tasks typically performed by a broad spectrum of practicing professionals in their work. Usually derived from a random survey of those in the profession and based on a task list constructed by an advisory committee from the profession. Those surveyed are asked to evaluate each task with respect to (a) importance (impact on the public health, safety, and welfare), (b) frequency of performance in their practice, and (c) relevance or need for competence in the task at the time of initial licensure.

KEY: 1. The option that is the correct answer to a multiple-choice examination item. 2. The grading plan and suggested correct answer given to the grader of a constructed-response item.

KNOWLEDGE: In the context of employment testing, and probably also applicable to licensure testing, knowledge is "A body of information applied directly to the performance of a function" (29 C.F.R. 1607.16).

LICENSURE: 1. Any method of occupational regulation in which the qualifications of individual practitioners are evaluated by a governmental body acting under authority of a law. 2. The most restrictive form of state regulation, that is, practice protection. Under licensure laws, a person may not practice a profession without first meeting the standards promulgated by the state and holding the appropriate license. [See PRACTICE LAW or ACT, and REGISTRATION (PROFESSIONAL)]

MINIMUM COMPETENCY: With respect to engineering, minimum competency is defined by the National Council of Examiners in Engineering and Surveying as "...the lowest level of knowledge at which a person can practice professional engineering in such a manner that will safeguard life, health, and property and promote public welfare" (National Council of Examiners in Engineering and Surveying, 1991, quoted in Everett and Mitroka, 1993). The same definition could be applied to a geology licensure examination by substituting "geology" for "engineering."

A more extensive definition of "minimum competency," targeted on geologic practice, was developed by a steering committee of geologists and is reported in Donnoe and others (1992): "A minimally competent candidate for licensure as a registered geologist shall possess the knowledge, skill and ability to accurately recognize, characterize, interpret and assess geologic conditions, resources and hazards as they relate to the health, safety and welfare of the public. This includes independently collecting relevant geologic data; understanding geologic literature, and reports and maps prepared by others; analyzing data to produce an accurate understanding of geologic conditions; and accurately and effectively communicating their results, conclusions and recommendations to peers and the public."

NOCA: National Organization for Competency Assurance.

NORM-REFERENCED SCORING METHOD: Grading on the curve. In essence, this forces the candidates to compete against each other rather than against a standard established by experts.

NSPE: National Society of Professional Engineers.

OBSERVABLE: Able to be seen, heard, or otherwise perceived by a person other than the person performing the action (29 C.F.R. 1607.16).

OCCUPATIONAL LICENSURE: Occupational licensure is a method of regulating a trade, occupation, or profession characterized by the licensure of individuals engaged in it. The license is issued and controlled by a government agency. Generally, occupational licensure is a power of the states. It is possible for the federal government to license a group that practices before one of its agencies. For example, Enrolled Agents are licensed by the Internal Revenue Service. Other methods used to regulate a group include the regulation of the industry rather than the individuals comprising it (the way the banking industry is regulated, for example) or through the authorization of a self-regulating organization.

OPTION. Any of the listed possible answers for a multiple-choice examination item.

PASSING SCORE (RAW): The number of points achieved by a candidate, or (more typically) the percentage of total possible points achieved by a candidate, on an examination, taking into account items that were deleted or double-keyed in the scoring process.

PASSING SCORE (FINAL OR ADJUSTED): The passing score of a registration examination should define the minimum level of competency needed in the context of licensure. Scores may be adjusted to take into account the difficulty of each item on the examination, by the Angoff method, for example, which see. Raw scores determined by the Angoff method are typically multiplied by a factor so that the minimum passing score is 70.

PRACTICE LAW (OR ACT). A law defining a scope of practice and restricting practice to those licensed or exempted thereunder. If one wishes to engage in the defined practice for others, one must be authorized under the law to do so. Usually also incorporates title protection.

PRACTICE GEOLOGY BEFORE THE PUBLIC, OR PUBLIC PRACTICE OF GEOLOGY: 1. (in simplified form) to practice or to offer to practice, as a professional in responsible charge of the work, to the public in general, i.e., to "hang out one's shingle" as a professional consultant. To stamp and (or) sign any letter, document, plan, manifest, chain-of-custody record, cross section, permit, application, report, or log as the responsible geologist or engineering geologist when the stamp and (or) signature of the responsible geologist or engineering geologists is required thereon by law, regulation, code, applicable standard, or ordinance. 2. (here written in the form of a definition incorporated into a licensure law) "Public Practice of Geology" shall mean the performance of geological service or work, such as consultation, investigation, evaluation, planning, mapping, and inspection of geological work, the supervision of such work, or the regulatory review of such work, in which the performance of the work is related to the public welfare or the safeguarding of life, health, property, and the environment except as specifically exempted by this book. "Public practice of geology" shall also mean the performance of geological service or work in the nature of consultation, investigation, evaluation, planning, mapping, and inspection of geological work required for or supporting compliance with municipal, county, state or federal law, municipal ordinances, or regulations developed pursuant to law or ordinance, or the regulatory review of such work. The act of signing, as geologist or specialty geologist, any document, report, application, permit, receipt, affidavit, or public record certifying, attesting to, or taking responsibility for geological work required by or supporting compliance with municipal, county, state or federal laws, ordinances, or regulations shall be deemed to be the public practice of geology.

PROFESSIONAL LICENSURE: A special case of occupational licensure. Professional licensure is based on a (state) law that defines the practice of a given field of professional activity, establishes minimum standards for its practice, provides procedures for evaluating the qualifications of applicants to practice and for the issuance of licenses to practice, and provides penalties for persons practicing without being licensed and for licensed persons practicing improperly. (Based on Brown, 1989.)

PSYCHOMETRICIAN: A psychologist who specializes in the measurement and evaluation of mental processes. This includes, for example, the construction and scoring of licensure and employment examinations.

PUBLIC PRACTICE OF GEOLOGY: See PRACTICE (GEOLOGY) BEFORE THE PUBLIC.

QUALIFIED GEOLOGIST, QUALIFIED ENGINEERING GEOLOGIST: In licensure statutes, generally applied during a grandfathering period (or for purposes of acting as a supervisor giving reference to an applicant for licensure); one who meets all the academic and experience requirements for licensure, but who is not licensed.

QUALITY ASSURANCE (OR CONTROL) REVIEWER (OR OFFICER): A person in a business firm, nonprofit organization, or public agency whose function is basically internal review of outgoing reports or documents to assure their compliance with the contract or agreement under which they were performed, or to provide independent in-house review of the outgoing material to assure internal consistency of the document or its compliance with applicable law, regulation, code, protocol, or other standards. A quality assurance (or control) reviewer (or officer) is, by the very nature of this particular job assignment, not in responsible charge

of professional work and that person's signature on a report or document cannot substitute for the signature of the professional who was in responsible charge of the work.

RECIPROCITY: Mutual recognition by boards of registration of the essential equivalency of the participating boards' licensure criteria. Allows a license to be granted by a board in one state based on licensure in another state.

REGISTERED GEOLOGIST: A geologist licensed to practice under a practice control statute. See PRACTICE LAW (or ACT).

REGISTRATION: 1. a state-sponsored system, created by statute, of verifying the credentials and competency of those who wish to practice before the public a profession the practice of which impacts the public health, safety, or welfare, and licensing them to practice. This is the most restrictive form of occupational licensure of individuals. See PRACTICE ACT, and LICENSURE. 2. The least restrictive form of regulation which usually takes the form of requiring or permitting an individual to file his or her name, address and qualifications with a government agency.

RESPONSIBLE CHARGE (OF THE WORK): To be "in responsible charge of the work" means to exercise independent control and direction by the use of initiative, skill, and independent judgment, of geological work, or the supervision of such work.

SIPES: Society of Independent Professional Earth Scientists.

SKILL: in the context of employment testing, and probably at least partly applicable to licensure testing, skill is "A present, observable competence to perform a learned psychomotor act" (29 C.F.R. 1607.16).

SME: See Subject Matter Expert.

STEM: In a multiple-choice examination, the stem is the initial part of an item. It is a statement to be completed, question to be answered, problem to be solved, or scenario to be analyzed.

SUBJECT MATTER EXPERT (SME): A member of a profession who possesses the qualifications and expertise to contribute to the construction, maintenance, and grading (scoring) of a licensure examination. SMEs may also perform related work, such as providing advice in the development of test security and scoring policies and procedures, and may assist in the development of the test user's guide, the proctor's manual, or the candidate's guide.

SUNRISE LAW: A law specifying a review process for proposed new occupational licensure laws before they will be considered by the legislature.

SUNSET LAW: A law specifying criteria for periodic review of the efficacy of one or more state agencies, a professional licensing board for example, and requiring legislative reauthorization for the continuance of the agency.

TITLE LAW (or STATUTE or ACT): A law defining a scope of practice and offering licensure or exemption with respect to the use of the "title" protected by the law, for example, professional geologist. Anyone may practice the defined profession, but only those licensed under the act may use the protected title. The licensure offered under a title act is often called "certification." Not all title acts require a written examination.

WORK BEHAVIOR: An activity performed to achieve the objectives of the job. Work behaviors involve observable (physical) components and unobservable (mental) components. A work behavior consists of the performance of one or more tasks. Knowledge, skills, and abilities are not work behaviors, although they may be applied in work behaviors (29 C.F.R. 1607.16).

Appendix 2

Strategies For Success In Passing A Geology Licensure Examination

Introduction

A candidate for a geology licensure examination must know more than just geology to optimize his or her performance on the exam. The most successful candidates will broaden their fields of study to develop an understanding of how licensure examinations are constructed and graded. They will be able to classify most questions and problems by type and they will know the philosophical and psychometric background behind the item. They will know the strengths and weaknesses of each item type. They will know what graders want to see in the answers to show-your-work problems. Chapters 13-16 and this appendix are, in a sense, a guided tour of the world of the test maker for the benefit of the test taker.

This appendix is not intended to serve as a universal how-to guide, but as a supplement to other exam study aids. I'll try to offer advice that seems to be hard to find in other sources, or has a different viewpoint. Much of my advice on exam preparation and taking strategies is based on my observations of common errors made by candidates in responding to questions and problems. Strategies are presented to help you with both multiple-choice and constructed-response items. Some of the strategies may be so obvious that you wonder why they are included. They are included because experience indicates that many candidates are unaware of them, or if they are aware of them they fail to practice them.

Definitions of terms such as "item," "stem," "option," "constructed-response," "distracter" and others that may not be familiar to the reader are given in Appendix 1. References in this appendix are listed in the References Cited section of the book.

Every candidate should evaluate books on licensure examination preparation and strategy found in local a bookstore or library. If generic guides are lacking at these places, geologists will benefit from looking at the general sections of exam guides for engineers. In the periodical literature, Everett and Mitroka (1993), and Williams (1993) offer worthwhile guidance. In recent years the Association of Engineering Geologists has sponsored written study guides and classroom instruction to assist candidates taking the California licensure examinations. (See "Reg Review" in the source lists in Appendix 4.)

The Unifying Theme

The unifying theme of this essay is take the exam as it is presented to you. This means

(1) Prepare well so you can take the exam that is in front of you, not the one you want to take, and not last year's exam.

(2) Do not read more into questions or problems than is there. Do not make unreasonable assumptions.

(3) Do not change the given parameters of problems to suit your style or preferences. In other words, follow the instructions. Do not use sophisticated problem-solving methods if a simple approach will work. Do not engage in unnecessary or gratuitous unit conversions.

(4) Politely assert your rights in the examination process. Do not hesitate to ask a board to provide what should be public information about the exam process and content. Do not hesitate to appeal a score that is close to passing.

Why Candidates Fail

Candidates fail the exam for a great number of highly diffuse reasons, not for one or two principal reasons. It is unlikely that you will find that more than a few of the many strategies given here are applicable to both you and your exam situation, but for many candidates a little help is all that is needed to make the difference between passing and failing. (In California, the median score is typically about 65%, and 70% is needed to pass.) Think a bit about the implications of this observation. I infer that almost all of those who fail the exam do so for reasons unrelated to the intrinsic qualities of the exam and more than likely related to their personal preparation for and reaction to the exam and the related processes and environment.

What Is The Best Attitude Toward The Examination?

Many licensure candidates are quite confident of their competence and view a required exam as an affront to their status, ethics, knowledge, and achievements. Many believe that the exam they failed (or are taking or will take) is not a fair exam; they question the competence and fairness of the item writers and graders.

I have participated nationwide with dozens of Subject Matter Experts over a period of several years in creating and grading exam questions and problems. I can assure one and all that a licensure examination constructed and graded under professional psychometric guidance is constructed and graded by many competent professional geologists (Subject Matter Experts) who labor mightily and honorably as volunteers. They know they are not perfect. Nonetheless, their efforts approach a very high degree of reliability even though candidates (who are not, of course, privy to the deliberations of the Subject Matter Experts) entertain fantasies to the contrary.

Some candidates harbor resentment against unexamined "grandfathers." Still others are revolted by the prospect of yet another examination after taking so many of them in school. Failing a licensure examination is, for most of us, something of a blow to our self-esteem. The mere thought of failing an examination can be devastating to your preparedness strategy and attitudes.

You might ask successful candidates how they did it. One person told me, "I just figured that the exam was incompetent on purpose, to test my professional maturity. Rather than allowing myself to become upset by what I thought was an imperfect exam, I came to think of responding succinctly and elegantly to the exam's deficiencies as merely another part of the challenge." (Fortunately he wasn't referencing an exam for which I had some responsibility!)

Absolute perfection in the examination and the examination process is often expected by applicants. The expectation of perfection, it seems to me, often stems from a hostile attitude held by applicants. This hostile attitude might be paraphrased as,

"I know I'm qualified and I know my practice and I've heard about a couple of licensed geologists out there who shouldn't, in my opinion, be practicing and when you tell me I have to take your exam you are telling me I have to prove I'm good enough and let me tell you something, who are you to judge me when I can show you all sorts of errors in your examination and defects in your whole examination process and when you tell me I'm not good enough you *@%# well better prove you are good enough to tell me that by being absolutely perfect yourself and demonstrating it by producing an absolutely perfect examination for me to take..."

A hostile attitude causes you to approach every problem or question looking for imperfections or exceptions or ways to interpret it other than a straightforward way, just to corroborate your suspicion that the exam is incompetent.

Even if satisfying facts can be marshaled to support these unproductive attitudes, that doesn't turn them into productive attitudes. It just gives them more strength to interfere with working the exam as it is presented to you. I have no magic wand to wave over unproductive attitudes and make them disappear. Somehow you, the candidate, must convince yourself that regardless of any supporting rationale, certain attitudes about the test are not productive. Identify these attitudes in yourself and divert the energy spent on them into more useful channels.

My message is that you know yourself, and whatever it takes to convince your brain that it should not become upset over real or imagined imperfections in the exam or the exam process, do it.

Preparation Strategy

Preparation strategy starts with developing a good, or at least a mature and accommodating, attitude. That is why attitudes were discussed first. Study the candidate handbook carefully. How much does it tell you in the way of responding to the rules and strategies I present in the following paragraphs?

Ask the Board for Information You Should Have

I encourage candidates to inquire about the availability of certain documents that should, in my opinion, be public documents. Of course, not all boards will agree with me on this matter, so let's keep the pressure on them. Those who face the ASBOG examination will have an exemplary Candidate's Handbook, so they won't have to worry about giving the administering board a hard time. There is (my opinion) no reasonable excuse for a board to refuse to treat an exam blueprint or validation study as a public document. Some boards don't want to do it because, I guess, it is inconvenient or expensive to respond to such requests. Perhaps they think responding gives an unfair advantage to the few candidates who do make such requests, or they think they might have to defend the study, or they think that the validation study reveals too much about their examination content. Well, properly constructed validation studies do not reveal too much about exam content, and if the board isn't proud enough of its validation studies to welcome the opportunity to defend them, it should discard them and start afresh. All candidates should have equal access to at least the essence of the exam validation studies through a comprehensive candidate handbook produced by the board.

The licensure mission of a board of registration should be to license all candidates who demonstrate at least minimum competence. A board can tell candidates its definition of minimum competence in appropriate and useful detail by giving them the exam blueprint and making its validation studies public.

Psychometricians with whom I have worked in examination preparation, as well as many of my fellow Subject Matter Experts, think that only the exam item bank, the direct work leading up to it, the answers, the item review documentation, and the scores and application records of individual candidates, should be confidential. Everything else, including validation studies and the exam blueprint, should be public documents.

If the information is not made clear by materials sent to you by the board, pick up the phone and call the board's executive director to find out how the examination was constructed. If the examination was created by a panel of Subject Matter Experts working under psychometric guidance, is based on a statistically valid job task analysis, and is considered to be valid under current psychometric standards, you have one situation. If the examination was contracted out to one or two local university professors who put it together one summer and also grade it, you have another situation. The first situation is far superior to the second from your viewpoint as an examination candidate. Why? Because more information is available,

about the psychometrically guided examination, and you can make more assumptions about it that are likely to be valid.

Form a Study Group

Many candidates report that forming a small study group with regularly scheduled sessions is very helpful. Some of the advantages are regularly scheduled sessions force the candidate into a good study pattern; mutual assistance in solving problems develops the problem-solving skills of all participants; candidates can share books and references and introduce each other to them; candidates can encourage each other to keep on studying; and candidates can share specialized knowledge and expertise.

If You Are Disadvantaged

If you are disadvantaged, prepare well in advance by knowing what accommodations can be made for you. Ask the board administering the examination how they accommodate the disadvantaged. Some jurisdictions may be better than others in conforming to evolving guidelines in this area, so it is to your benefit to know the guidelines yourself and to make early inquiry. The American with Disabilities Act (ADA) sets forth certain standards. The Association on Higher Education and Disability (AHEAD) publishes a pamphlet titled "Testing Accommodations for Persons with Disabilities Under the Americans with Disabilities Act: The Impact on Licensure, Certification and Credentialing." It is available free from AHEAD, P.O. Box 21192, Columbus, Ohio 43221-0192, or telephone (voice/TDD) 614/488-4972 or 800/247-7752.

Put Some Effort into Spelling

Spelling is fundamental. Double-check and triple-check your spelling abilities. While it might be argued that the spelling difficulties of some rare individuals fall under the intent of the ADA, it must also be said that poor spelling in a professional report cannot be tolerated if it adversely impacts the public safety by obscuring the meaning of the text, or, in and of itself, calls into question the abilities of the author and thereby opens the document to challenge. If you can't spell the simplest of technical terms correctly on an exam, why shouldn't the grader question your knowledge, comprehension, and competence? If you weren't paying enough attention in class to learn how to spell geological terms correctly, what else did you miss?

Here is a list of misspelled words that I encountered when grading a constructed-response test question. About 7% of the candidates made one of these spelling errors, and a few provided two or three different misspellings of the same word in one paragraph! Can you identify the words that these candidates were trying to spell? Don't you agree that a licensed geologist should be able to spell correctly at least two of the three words or terms represented in the list? The list: reichter, Reichter, Ricter, Reichtr, Rossi-Ferri, Rossi-Feri, Mercale, Mercali, Mercille, Mercate, Mercater, Metichner, Mitchner, Merchelli, Mercilte.

Study the Basics

The exam should be targeted toward candidates who have the minimum experience necessary to take it, the so-called "entry level" candidates. "Entry level" is a term that is hard to define. Hertz (1995) suggests that entry level for the purposes of licensure examinations generally means about 5 years of professional experience. Of course, we all know that there is a difference between having 5 years of progressively responsible professional experience and having the first year's experience five times.

Your study should concentrate on the appropriate level of knowledge for the examination. Granted, although what is elementary to a petroleum geologist with 5 years of experience seems advanced to an engineering geologist with 5 years of experience (and vice versa), you should still find, within your field and related basic knowledge that the items are largely clustered around

the entry level. While this means your study should include a healthy dose of academic basics learned in lecture, laboratory, and the field, don't forget to review problem-solving skills you learned or judgment and insight developed on the job. A good examination will test representative knowledge, skills, and abilities learned during the first few years after graduation.

Most assuredly, it is important to know (and know how to use) basic laws, such as Darcy's Law, and basic structural geology techniques, such as how to recognize and solve a three-point problem, draw a cross section, project a dipping structure on a topographic map, etc. Doing elementary groundwater chemistry problems and plotting derived data on a Stiff diagram should be a piece of cake for you. For nearly all exams you will have to memorize some equations. Working lots of problems that use those equations will help your memorization. If you are mathematically adroit, you can memorize certain key equations and derive others from them if necessary.

Find out if the exam includes a practical section that requires you to work with actual rock specimens or aerial photographs. If you are not taking the ASBOG examination, you may find state-specific items on the exam. Some states supplement the ASBOG examination with a state-specific examination that might cover either that state's geology or the laws, rules, and guidelines of that state, its agencies, and its board of registration. Hone your skills appropriately.

In keeping with the theme of studying the basics, recognize that it may not pay to refine your techniques in problem solving or equation solving abilities that are typically used for problems that require, say, much more than an hour to analyze and solve. If you know from experience, the grapevine, or the exam blueprint that such abilities are necessary, then by all means build your skills in them. However, the general strategy of exam design as implemented by statutory boards seems to favor a larger number and wider variety of questions and problems requiring less time each to solve over a smaller number of specialized problems requiring, say, an hour or more each to solve. If you must solve eight problems in four hours, and they all look to be of about the same degree of complexity and sophistication, obviously your average time per problem should be about one-half hour and no one problem should take more than about an hour.

With respect to major, time-consuming problems that are too long to appear on the exam, concentrate on knowing the characteristics and limitations of the method, when it should and should not be applied, and what the alternative methods are and their comparative advantages and disadvantages, rather than concentrating on the ability to execute a direct solution of such problems. In other words, know the procedures and options well enough to make policy and value decisions if such questions are asked on the examination.

How Much to Study and Study Emphasis Strategy

Everett and Mitroka (1993) suggest that about 100 hours of study time is enough for well-qualified applicants for the P.E. exam, (who have, of course, passed the F .E. exam). Perhaps 100 to 200 hours might be a comparable goal for most candidates for an 8-hour geology exam. Some candidates will strongly disagree with me on this point, and I won't deny that, say, 500 hours of study might work well for some individuals. Exit polls might shed more light on this matter by asking a few questions about hours of study and study emphasis strategy.

Study emphasis strategy will vary with the nature of the particular exam you will take. If the exam is all multiple-choice questions, you will have to study broadly in the topics listed in the exam blueprint. If part of the exam has major, time-consuming, constructed-response items, whether essays to write or problems to solve, your study emphasis will vary with the nature of the required problems if there are any. Everett and Mitroka (1993) point out that if the candidate can choose which problems to solve, then it is in the candidate's best interest to study only the types of problems in which the candidate already has proficiency or can acquire it easily, foregoing study and expertise in problem topics that are outside the candidate's interest and experience—provided, of course, that the scope of the candidate's study prepares him or her to get a passing score. Exams can change over time in their philosophical approach

to this issue. In 1994, the California Registered Geologist examination was changed to require candidates to demonstrate problem-solving proficiency in several content areas.

Some candidates have reported that prewriting a few essays or short answers helps to instill the proper thought sequences in their minds, and is also a help in recall for multiple choice items.

Stress Relief

All of us react to stress, and a licensure examination is a stressful situation. To handle the stress in the exam room, you should prepare by learning to recognize stress symptoms in yourself. Lacking any significant training in psychology, I am hardly qualified to offer anything but the most general of suggestions. First, recognize that you are very likely subject to becoming stressed about the exam both before and during the taking of it. Over-studying is not only unnecessary, it can lead to debilitating stress.

Candidates tell me that they recognize stress in themselves during the exam by some of the following symptoms: tight or tense muscles, especially in the neck, back, and shoulders; shortness of breath; headache; nausea; and a sense that their brain is "racing." If you are overcome with stress during an examination, experienced candidates recommend deep breathing exercises or other (not too obvious or disruptive) muscle exercises to relieve the stress and slow down the brain.

It certainly seems likely to me that some small proportion of candidates who are fundamentally able to pass the licensure test yet fail it several times have fallen victim to stress or a hostile attitude, or both. If you are in this group, consider seeking either self-learning or counseling from peers or professionals to be able to deal with the stress of the examination and the licensure process.

Exam-Taking Rules

I'll call out four important rules before we get into strategies.

Rule No. 1: don't break any of the rules set out in the candidate's handbook, the exam, or in the instructions given before the exam starts. The advice that follows is generally applicable, but in some cases it might be contrary to local rules or custom. In those cases, local rules or custom prevail.

Rule No. 2: understand the scoring paradigm. Use this information to guide your exam-taking strategy. Know exactly how far forward and backward you can move in the entire examination booklet and answer sheet at every milestone during your stay in the examination room. Know if there is a penalty for guessing, and what it is.

Rule No. 3: understand the rules and procedures for reviewing your exam papers or answer sheets and take advantage of your rights in this respect.

Rule No. 4: work within the system. Be honest in your application, references, and in taking the exam. Do not attempt to compromise the exam yourself or with others.

Exam-Taking Strategies

These strategies are based on the currently universal exam format that uses paper-and-pencil technology. If you face a computer-based or a computerized adaptive testing (CAT) examination (both of which you take using a computer terminal) your strategies might require major adjustments (see, for example, Raymond, 1995, and Showers, 1995).

Strategy No. 1

Once you can open the exam booklet, analyze the exam to the extent allowable. If you are permitted, scan through all of the questions and problems, section by section, to get a feel for

the content. Identify (and so mark) tough problems that you haven't a hope to solve and those that you can solve in your sleep. If there are optional and required problems, determine how your personal expertise can be optimized within the rules and the time available. If the scores on mandatory and optional problems are lumped together, does it make sense to start with or to put most of your effort in the optional problems? Must you pass parts of the exam in a particular sequence? If so, how does this govern your efforts?

Strategy No. 2

Work the exam as it is presented to you. By this I mean the following.

(a) Don't try highly sophisticated (time-consuming) problem-solving approaches until you have carefully eliminated all simpler approaches. Exam problems may require some geological insight to solve in an elegant and simple way, but practicality says problems that require very time-consuming procedures to solve cannot be used. If your approach is involved and time-consuming out of proportion to the points allowed for the problem, and out of proportion to the entire exam plan, you are probably using the wrong approach. Abandon it and move on to problems that suit your expertise of the moment.

(b) If you find yourself lost in a do-loop or beating your head against the proverbial brick wall, stop. Don't be so stubborn in trying to solve a recalcitrant problem that you lose track of time and can't finish the exam or spend appropriate time on other problems. Do people really make this strategic blunder and fail the exam because of it? Yes, they do. Stress may be a factor.

(c) Read the items carefully. Be alert for "not" or negative words that change the meaning. A well-constructed item will avoid the use of double negatives, but watch out for them. In some, but not all, exams, "not," if used, will be printed in all capitals to draw your attention to its presence. Similarly, in well-constructed items, absolutes (e.g., always, never, every) will not be used casually, or perhaps not used at all. If an option has an absolute term in it (or implied to be in it because it is stated in the stem), it is probably best to consider it as a tentatively viable option even if you can think of a far-fetched exception to the absolute. The more far-fetched your exception to the absolute, the more likely it is that your exception is not a reason to ignore the option as a tentatively viable answer.

It is also possible to come across terms such as "What is the one best answer among those given?" and "From the options listed, which one is the most appropriate action under the circumstances described?" Note that these terms limit your mental excursions into exceptions because they limit your selection to the options listed and your thinking to a fairly straightforward and simple set of assumptions about the described situation.

Some candidates believe they perform better if they read the stem of a simple multiple-choice question and try to think of the answer before they look at the option list. Then they examine the option list and see if the answer they believe to be correct is present.

If an item refers to a figure, review the figure carefully. Important information may be present in the notes and general information on the figure.

(d) Don't let your sophistication in some subject areas (or a hostile attitude) lead you to answer simple questions with an answer that is technically defensible on the basis of rarely applicable and excruciatingly detailed knowledge, but not the answer that the exam item writer wanted on the basis of generally applicable entry-level knowledge. To do this is merely to engage in sophomoric games, and the exam is not the place to play games and split hairs. While I can't use a geology exam question as an example, I can provide a sample question that is subject to the same type of hair-splitting analysis that some candidates practice on geology exam questions.

In this sample question your highly detailed knowledge should allow you to decide "Well the right answer, at my highly sophisticated level, is obviously `b,' but I can't believe that the guy who wrote this question knows as much as I do about the topic, so I'll answer it from the point of view of entry level sophistication rather than from the point of view of my expert level of sophistication."

The question: How many states does the United States of America presently have?

a. 51
b. 46
c. 48
d. 50

Of these options, the answer that is closest to correct in literal terms is, obviously, b, 46, because you know that Massachusetts, Pennsylvania, Virginia, and Kentucky are called commonwealths, not states, in their official names. Fifty members of a union of commonwealths and states, less the four commonwealths, equals 46 states, right? Well, maybe not. You could make the argument that the correct answer is 45, which is not given as an option, because you know that the official name of Rhode Island is "State of Rhode Island and Providence Plantations," and thus, not being simply and only called a state in its official name, should not be included on a list of "states" in the United States. But you go ahead and choose d, 50, as the answer because you judge that it is the appropriate answer choice for the sophistication of the test.

(e) Don't look for trick questions. If the exam is properly constructed, there will be none. Don't make simple questions into trick questions by looking for rare exceptions to a governing generality and letting them guide your answer. (You could have gone down this path in answering the sample question in point d.)

(f) Evaluate all problems to see if the mathematical basis is simple. For example, if the two sides of a right triangle are 3 and 4, respectively, the hypotenuse has to be 5 and you shouldn't have to spend time calculating it. A problem that requires you to plot locations of certain points from given data may turn out to be geometrically simple, perhaps involving simple triangles that can be used to determine certain needed distances easily. Keep this possibility in mind so you don't waste time with unnecessary work.

(g) This section will provide insights about the mistakes item writers can make if they are inexperienced or if psychometric guidance is lacking or inattentive. You should be able to find out or judge if you are taking a psychometrically sophisticated test or a test that lacks good psychometric controls and choose a course of action for the examples given.

One symptom of an unsophisticated test might be the presence of several items containing double negatives. Item writers are told to avoid double negatives because they give an advantage to good test takers. Another symptom of an unsophisticated test is the presence of absolutes (e.g., always, never, every, all, none) in many items. A well-known weakness is the tendency by the item writers to choose the third option in a list of four as the key. In a sophisticated test, the options are scrambled randomly, so the key might be in any position.

Options should all be grammatically consistent with the stem and mutually exclusive. Options that are not grammatically consistent with the stem are likely to be distracters. Options that are not mutually exclusive are evidence of poor control over the test writers and should be challenged. All options should carry the same "sense" in completing or answering the stem. For example, a well-writtem option list will not consist of three options that are geographical and one that is time related (Ebel, 1979). Allowing the item writers just a little slack, you might find a very few of these defects on a well-constructed exam. If defects are numerous, you are facing an unsophisticated or poorly constructed examination.

Multiple-choice items with option lists ending in "all of the above" or "none of the above" may be weak points. You may find that the item writers fell victim to a normal tendency to make "all of the above" the key in most or all cases where it is used, and to make an option other than "none of the above" the key in most or all cases where it is used. If you judge that you are taking a psychometrically unsophisticated test, you may choose to give some weight to this observation. If you judge that you are taking a psychometrically sophisticated test, you should assume that "all of the above" is not necessarily always (or generally) the key, and also assume that you cannot always rule out "none of the above" as a possible key.

Inexperienced item writers will sometimes detail the key to a greater extent than the distracters. The key becomes obvious because it is considerably longer than all the other options. You might encounter the situation where, of four options, two are fairly short and of subequal

length and two are longer and of subequal length. This is likely the result of careful psychometric guidance and does not mean that one of the longer options must be the key.

Strategy No. 3

Know about where you are in the exam timing sequence at all times. Develop a sense of how much time you have left and the difficulty level of the unanswered items. Try to save some time for a review at the end of each timed section, or for implementing Strategy No. 4.

Strategy No. 4

In a multiple-choice exam, do not answer items that you can't answer immediately with reasonable confidence, but try to keep them in mind. As you work the remainder of the exam, ideas may occur to you that help in answering those tough items, or even make you change your mind about a few items that you thought you had down cold.

It is critical, in implementing this strategy, that you save enough time at the end of the timed session and to scan all unanswered items and then rapidly enter your best-guess answer. How you implement this strategy will vary with the guessing penalty, if any, incorporated in the exam scoring plan. Know what it is. If there is no penalty for guessing, it can't hurt to guess. But you must save time to do it. If there is a penalty for guessing, only you can evaluate the risks and rewards on either a universal level, or item-by-item level.

When I suggest guessing in the context of this discussion, I am suggesting a very fast, but reasoned, if somewhat intuitive, process of elimination to select a potentially correct response in the absence of time or sure knowledge of a way to derive a correct response. In support of "guessing," it seems appropriate to repeat here a few concepts from Chapter 14. Ebel (1979) states that the "guessing" done by candidates on multiple-choice problems is actually a process of elimination. He points out, "...the knowledge and ability used to eliminate the incorrect alternatives can be, and usually is, related to the knowledge or ability that would be required to select the correct alternative."

Increase your odds by looking for obviously wrong options and then choosing one of the remaining options. Perhaps some of the ideas given in Strategy 2 will be applicable here. (Again, in a well-constructed item, all distracters will be plausible to the candidate lacking specific knowledge; there will be few, if any, items with "giveaway" distracters.)

Does guessing at answers on a licensure examination raise an ethical issue in your mind? A flippant response would be to quote my old structural geology professor who once told me, "There's many a mine owner who would rather employ a lucky geologist than a good one." I think that responsibility for resolving this ethical issue (or establishing that an ethical issue exists) lies with those who create the scoring criteria for the examination, not with the exam candidates. If guessing is not penalized by the exam scoring procedures, candidates should feel free to guess at will. In my mind, guessing at multiple-choice answers is no more unacceptable than the guessing (and bluffing!) that candidates unabashedly do in answering hand-graded constructed-response items. Candidates who are not inclined to guess should realize that others in the candidate population feel no restraint and therefore may gain an advantage.

Strategy No. 5

If a constructed-response (show your work) problem requires the use of an equation, write the equation at the top of the answer sheet first. If you write down the correct equation, it at least demonstrates that you know something about how to solve the problem. The scoring of a multiple-point equation-based problem might (or might not) include a point or two for writing down the correct equation.

Next, organize your work so that it is presented in a logical progression of thought and action from beginning to conclusion. If you just start writing down scattered and unorganized sets of numbers and expressions that fit (or don't fit) here and there in the equation, put them together in some unclear way to derive an answer, and the answer is wrong, you will probably

get no credit for your work and certainly get no credit for knowing the equation because you did not start off with a clear statement of the equation. Even if no points are granted for stating the equation, putting it down on paper will help you remember all the terms and how they operate on each other.

Some candidates will carefully list the assumptions they make in solving a constructed-response problem. This can be helpful to both you and the grader. Caution is required on your part in two areas. (1) Do not spend so much time exquisitely outlining your assumptions that you have no time left to solve the problem. (2) Do not make unreasonable assumptions that lead you to solve a problem that differs from the one in front of you.

How do you know if your assumptions are unreasonable? Here are some hints: your assumptions create a problem the solution of which is disproportionately complex and time-consuming; your assumptions create a problem that requires highly sophisticated techniques or mathematics to solve; your assumptions transform a general problem into a specific one that is based on your current field of expertise; and your assumptions ignore, discard, or redefine important numbers or conditions given or imposed in the stem of the problem or accompanying figure. If your assumptions meet one or more of these four tests, perhaps you incorrectly analyzed the problem and should take a fresh look at it.

Strategy No. 6

A particularly dangerous situation occurs with mathematically based problems. Many candidates fall into deep trouble by failing to pay close attention to units of measurement and unit conversions. While the difficulty is ubiquitous, candidates seem to get into unit recognition and unit conversion trouble very easily in groundwater problems. There are three distinct types of errors: (1) misreading the units stated in the stem, that is, treating them as if they were some other unit, (2) failure to keep track of unit conversions and carry them through a problem consistently, and (3) engaging in unnecessary or gratuitous unit conversions.

Misreading of units can be cured if you know it is a common error, and if you take care in reading the text of the problem. Similarly, be aware of the need to track your unit conversions carefully through the problem. Don't make the mistake of converting a number that has already been converted. The third strategic or performance error, engaging in unnecessary or gratuitous unit conversions, is discussed in detail below.

As a rule, question, context, and convention permitting, try to work with units that are (and result in) the smallest, simplest, numbers. Try to work with the units given in the problem. Avoid, if you can, units that require you to work with large numbers in the hundreds of thousands or millions. Avoid, if reasonable, converting large numbers to exponential form. In the every day working world you might be able to convert numbers with strings of zeros to exponential form and then multiply and divide them correctly in your head while drinking a cup of coffee. In the exam room, believe me as a grader of problems, few test takers handle exponents correctly even if they can use a calculator.

Do not convert English units to SI units (or vice versa) unless required.

If a groundwater problem is given in units of acre-feet and the answer requested is a volume, solve it in units of acre-feet. I am at a loss to explain why some candidates will attack a problem like this by converting acre-feet to thousands or tens of thousands of cubic feet, or to millions or hundreds of millions of gallons, solve the problem in cubic feet or gallons, and then convert back to acre-feet. But they do, and they make mistakes and lose points because of gratuitous unit conversions.

Every unit conversion you do has the chance to move your answer a little farther away from the keyed answer, because (1) your conversion factors might be just a little different (for example, 326,000 gallons per acre-foot instead of 325,900 gallons per acre-foot) than used by the question writer or the grader, (2) multiple or chained unit conversions exacerbate the problem just described, and (3) every unnecessary unit conversion introduces an unnecessary chance for you to make an error.

Examine the whole problem first to see what units are given and what unit conversions might be necessary or avoidable. Maybe the first, short part calls for units of gallons and the

answer is one of several inputs to the second, more complex, part. The second part has all the independent input data (four different numbers, say) given in acre-feet or units that work out readily to acre-feet as you solve its parts. In that case, solve the first part in gallons, convert that one number to acre-feet, and solve the rest of the problem the way it was set up for you: in acre-feet. Do not solve the complex part of the problem by converting all four of the of the acre-feet input numbers to gallons just because the first part (one input number of the five used in the second part) was given to you in gallons. Not only does this waste your time, you will make a mistake and it will cost you points.

Do people really make these strategic blunders and give up points because of it? Yes, they do. Far too many of them.

Strategy No. 7

Check your work in mathematically-based problems with some eyeball or experienced-based quality control. After all, this is what you should be doing now and will have to do as a licensed professional reviewing and supervising the work of others. In many situations you should be able to use experience and judgment to spot, in an instant, an answer that is wrong by a factor of two or more. Think carefully about the way you wrote the equation you used to solve the problem. Is it the right one? Did you write it in the correct form? Common errors in writing down the equation to be used include

(1) Placing a divisor term in the dividend, or vice versa;
(2) Interchanging a pair of divisor and dividend terms;
(3) Using an exponent of 1/2 when it should be 2, or 2/3 when it should be 3/2, or vice versa;
(4) Interchanging plus and minus signs, for example, writing $n(R + 1)/(r - 1)$ when the correct version is $n(R - 1)/(r + 1)$;
(5) Leaving out a term. The initial 1/2 found in some equations is an easy term to leave out, especially if it is expressed as a stand-alone fraction that precedes a complex expression.

Common errors in executing an equation, regardless of whether it is correctly written, lead to results that are incorrect by factors of 2, 4, 5, 10, 100, 1000, or their inverses. Answers that are wrong by factors of 10 or its integral multiples typically result from misreading or miskeying an exponent of 10. Answers wrong by a factor of 2 typically result from ignoring a factor of 1/2. Answers wrong by a factor of 4 usually result from multiplying by 2 instead of dividing by 2, and of course you can divide by 2 instead of multiplying by 2 and your answer will be 1 /4 of the correct answer (these errors are often made in solving complex fractions). Answers wrong by a factor of 5 typically result from combining an error involving a factor of 1 /2 with one involving a factor of 10.

Take a look at your results. Is your answer in a reasonable range of values for the given data? If not, you may have made one of these errors.

Analyze your work for mathematical errors very carefully if an early part of a problem requires you to generate numerical results that will be plotted and analyzed in a later part of the problem. You might suffer from a double-whammy if your initial results are wrong, misleading you in the next analysis in the problem. For example, if you incorrectly solve a complex fraction in calculating MEQ data for a water chemistry problem, you might conclude that the ion balance is in disagreement when in fact it is not. Your commentary on the validity of the lab work or testing protocol will be in error, and your Stiff diagram will be in obvious disagreement with the grader's key. Incidentally, one of the favored ways for item writers to develop distracters for mathematically based multiple-choice problems is to solve the problem in several typically wrong ways and to provide as distracters the answers that are derived by the typically wrong solutions. Therefore, just because your first-try answer agrees with one of the options does not necessarily mean that your answer is the right answer.

Suppose you just decided that absolutely, positively your answer to a constructed response problem is horribly wrong and there is no time left to redo the problem. What do you do? Append a note that says why the answer is probably wrong and define the nature of the errors

you have made and indicate the probable impact of correcting those errors on your answer. It may or may not help, but it can only hurt if you were wrong in deciding that your answer was wrong. Yes, this sword can cut both ways.

Strategy No. 8

Don't show off your sophistication unnecessarily by using a complex equation to solve a problem away with a given data set. For example, both Dupuit's Equation and Darcy's Law might be usable. Darcy's Law is simpler in form and was probably used by the question writer to solve the problem. If you use Dupuit's Equation you run two risks: (1) you can more readily make a mistake because it is more complex, and (2) because its fundamental assumptions differ from those of Darcy's Law, your answer might vary from the keyed answer if the key was derived, as it probably was, using Darcy's Law.

If you want to use an alternative, more complex, or more sophisticated method to solve a problem, just remember that you are more likely to receive credit for a valid alternative solution if answers are hand graded instead of computer scanned.

Strategy No. 9

Make the grader's job easy. Even if you dislike the exam process there is little excuse for sloppy, careless, unprofessional presentation of your work in constructed-response problems or essays. Graders understand that candidates do not all have Spencerian penmanship, do not always have the time to work neatly and in a well-organized way, and are under unusual pressure in the exam room. Within applicable guidelines, they will try to make allowances for these factors. Nonetheless, if you present your work in a well-organized and easy-to-read manner you will get all the credit possible because the grader can find what he or she is supposed to find without having to winnow and sift for a few kernels of truth among the extraneous notes, or follow a chain of logic into and out of blind alleys. The grader cannot read your mind and score your response accordingly.

Accept the parameters of a constructed response problem as unchangeable givens unless it is clearly indicated that you are free to ignore some or all of them. Do not change the predesignated scales on graphs, maps, or cross sections you are to draw or complete. If the answer sheet has a graph with scales assigned to the axes or a cross section box with vertical and horizontal scales indicated, use those scales. If you construct a map, section, or graph from scratch, be sure to state map, section, or graph scale; label axes with the appropriate units; and give numeric values as appropriate to the tic marks on the axes.

Suppose you were to construct a cross section in a box with predesignated scales and the vertical exaggeration is 4x. Maybe you personally prefer to work with no vertical exaggeration, but if you change the predesignated vertical scale on the cross section to one with no vertical exaggeration, you are not solving the problem given to you and you will likely be graded accordingly. Think: "How will my cross section look when compared to the grader's key?" Well, it certainly will not look like the grader's key if you change the vertical scale by a factor of four! Your petulance will give you a two-strike handicap at the start. Why take the chance you might have to pursue a problematic appeal by changing the givens to suit your own style? Express your individuality, creativity, and fresh approaches in a free-response essay problem, but not in a constructed-response problem that constrains your mental excursions with numerous givens.

If a constructed-response problem requires an answer defined by units of measurement, try to use the same units that were used in the stem if it is reasonable and conventional to do so, unless you are required to do a unit conversion for the answer. The grader has a key that typically gives the answer in only one unit of measurement: the simplest, easiest, and most conventional in the context of the problem. If you are required to solve for P-wave velocity and no specific units are indicated, you may argue that you are within your rights to present your results in units of furlongs per fortnight and thus force the grader to do a unit conversion to assess your answer. Do it if you wish, but think about the risks you accept.

A Final Note on Implementing the Suggested Strategies

The suggested strategies are not universal, and some may not be acceptable in every venue. It is up to you to examine each problem and the exam in part or as a whole and decide for yourself which strategies to implement as presented, which to implement with your own modifications, and if or when it is appropriate to do so.

Challenging Examination Items

Suppose you believe that some of the items are imperfect to an unacceptable degree. How can you express your opinions? There are a few ways. Your critique, as with any professional critique, should be based on knowledge you have acquired about the subject. If you want to critique an examination item, learn how good examination items are constructed and use that as a basis of your critique. (See, for example, Chapters 13 through 17.)

If you detect a nonvalid question while you are taking the exam, and you are right about it, the probability closely approaches 100% that the faulty question will be detected during grading (if the Angoff criterion-referenced method is used) and scores will be adjusted accordingly. Therefore, do not let your detection of a nonvalid question upset your thought processes so much that it affects your performance on the rest of the examination. Do answer it as best you can, basing your answer on the most general case you can imagine that fits the scenario posed.

If you challenge the exam, do yourself a favor by challenging more than enough points to bring your score up to a passing level.

If you fail an exam that is hand graded, challenge it by requesting to review your papers and their grading. First, check to see if the scores on individual parts or problems are correctly derived from their subtotals (if appropriate), then check to see if the scores on each part are correctly added. If you get a passing score at that point, stop. Just get your passing score entered and present your other critiques later, after you are registered and therefore "in the system" rather than being an "outsider." There is no reason to start a mortar barrage when your sharpshooter has given you a victory.

If this first exercise does not yield a passing score, look for questions or problems that are improperly keyed. "Improperly keyed" means that the grader or scoring machine was given a wrong answer and told it was the right answer, or that there is more than one logically right answer. If necessary, get your challenging ducks in a row by doing research and presenting examples and citations to support your view.

In some jurisdictions you can request a hand regrading of the computer-scored "fill in the bubbles" answer sheet. An experienced psychometrician told me that about 1 in 1,000 hand regrades of these answer sheets results in change in score. If you know you did a sloppy job of filling in the bubbles, or suspect your erasures were not thorough, the odds of a changed score will increase.

Wrapping It Up

The best chance of success evolves from the best preparation and implementation of the best exam-taking strategies. If you can control unproductive attitudes, prepare well, and know your exam-taking strategies, your chance of success will increase markedly.

Appendix 3

Directory Of State Boards Regulating The Practice Of Geology

Compiled by the AEG Committee on Professional Registration for Engineering Geologists

This listing provides the name, address, and telephone number for each state board of registration (or other body with similar function) in the United States. Personnel, addresses, and telephone numbers, as well as extent of regulation, are subject to change. Always contact a board or regulatory office for the latest versions of their laws and regulations before making important decisions or practicing in their jurisdiction.

Certain states have adopted a statutory definition of "geology" and (or) "geologist." These states, which have no regulatory boards, are Colorado, Kansas, and Oklahoma. These states, plus those listed below, total 28. States that partially regulate geologic practice through specific offices or departments are listed at the end of this compilation.

Alabama

Licensure act signed by governor. Effective date is 1 year after the board calls for applications. Board not yet in operation.

Alaska 907/465-2535 Karl Luck, Director

Alaska Dept. of Commerce and Economic Development Division of Occupational Licensing
P. O. Box 11086
Juneau, AK 99811-0806

Arizona 602/255-4053 Ronald W. Dalrymple, Executive Director

Arizona State Board of Technical Registration 1951 West Camelback Road, Suite 250
Phoenix, AZ 85015

Arkansas 501/663-9714 Dr. Doy Zachary, Chairman

Arkansas Board of Registration for Professional Geologists c/o Arkansas Geological Commission
3815 West Roosevelt Road
Little Rock, AR 72204

California 916/445-1920 Dalton Pollard, Executive Officer

State Board of Registration for Geologists and Geophysicists 400 R Street, Suite 4060
Sacramento, CA 95814-1920

Delaware 302/739-4522, X207 William Schenk, Chairman

Delaware State Board of Registration of Geologists Cannon Building, Suite 203
Post Office Box 1401
Dover, DE 19903

Florida 904/488-1105 Dr. Angel Gonzalez, Executive Director

The Board of Professional Geologists
Dept. of Business and Professional Regulation 1940 N. Monroe Street
Tallahassee, FL 32399-0764

Georgia 404/656-2281 Barbara Kitchens, Executive Director

George State Board of Registration for Professional Geologists Secretary of State, Examining Boards Division
166 Pryor Street S. W.
Atlanta, GA 30303

Idaho 208/334-2268 Raymond W. Tekverk, Chairman

Idaho State Board of Registration for Professional Geologists State House Mail
Boise, ID 83720

Illinois

Licensure act signed by governor on August 18, 1995. Effective date July l, 1996; board not yet in operation.

Indiana 812/855-5067 Tammy Watson-Fleck, Certification Coordinator

Indiana Geological Survey 611 North Walnut Grove Bloomington, IN 47405

Kentucky 502/564-3296 David C. Scott, Chairman

Kentucky Board of Registration for Professional Geologists Division of Occupations and Professions
Post Office Box 456
Frankfort, KY 40602

Maine 207/582-8723 Andrews L. Tolman, Chairman

Maine State Board of Certification for Geologists and Soil Scientists Dept. of Professional and Financial Regulation
State House Station 35
Augusta, ME 04333

Minnesota

Licensure Bill signed May 22, 1995.
Effective date depends on completion of board appointments and development of regulations.

Missouri 314/526-7625 Loree Kessler, Executive Director

Missouri Board of Geologist Registration 3605 Missouri Boulevard
Post Office Box 1335
Jefferson City, MO 65102

North Carolina 919/850-9669 Robert M. Upton, Administrator

North Carolina Board for Licensing of Geologists P. O. Box 27402
Raleigh, NC 27611

Oregon 503/378-4180 Edward B. Graham, Administrator

Oregon State Board of Geologist Examiners 750 Front Street, N.E., #240 Salem, OR 97310

Pennsylvania 717/783-7049 J. Robert Kline, Administrative Assistant

State Board of Registration for Professional Engineers, Land Surveyors, and Geologists
Bureau of Professional and Occupational Affairs P. O. Box 2649
Harrisburg, PA 17105-2649

South Carolina 803/253-4127 Ms. Sam Swinehart, Executive Director

South Carolina Board of Registration for Geologists Post Office Box 11904
Columbia, SC 29211-1904

Tennessee 615/741-3449 Marilyn Evelyn Hand, Assistant Commissioner

Tennessee Dept. of Commerce and Insurance Division of Regulatory Records, Geology
Section 500 James Robertson Parkway
Nashville, TN 37243-1139

Virginia 804/367-8307 Peggy Wood, Administrator

Virginia Board of Geology
Commonwealth of Virginia
Dept. of Commerce
3600 West Broad Street, 5th Floor Richmond, VA 23230-4917

Wisconsin 608/266-1398 Ms. Jan Bobholtz, Licensing Coordinator

Wisconsin Department of Regulation and Licensing 1400 East Washington Avenue
Post Office Box 8935
Madison, WI 53708

Wyoming 307/766-2490 Gary B. Glass, Secretary-Treasurer

Wyoming Board of Registration for Professional Geologists Post Office Box 3008, University Station Laramie, WY 82071-3008

Certain states partially control the practice of geology by requiring some level of registration for groundwater work, notably for geologists working with underground storage tanks (UST) and hazardous waste. Contact information is given below for these states. Geologists who wish to practice in these states in the general fields noted should be sure to make contact and follow

applicable rules. There is no "Board of Registration" in these states. "Registration" is implemented by the state office noted.

In Iowa, certain groundwater professionals must register with the UST program in the Department of Natural Resources. Contact: Paul Nelson, Iowa DNR, Underground Storage Tank Section, Wallace State Office Building, 900 East Grand, Des Moines, IA 50319. Telephone 515/281-8779.

In **New Jersey**, the UST regulations have a definition of qualified groundwater consultant and a certification program is in place. Contact: Loretta Hadiman, Bureau of Underground Storage Tanks, Division of Natural Resources, CN-039, Trenton, NJ 08625-0029. Telephone 609/633-7174.

In **Nevada**, USTs and hazardous waste consulting come under the purview of the Division of Environmental Protection. Contact: Ralph Capurro, Certification Supervisor, Department of Conservation and Natural Resources, 123 West Nye Lane, Carson City, NV 89710. Telephone 702/687-3016.

In **Texas**, some of the following offices may or will require specific permit data to be submitted by a qualified geologist or specialty geologist, as determined by that office. Check with the appropriate office as its name or function indicates in the following list.

Texas Natural Resources Conservation Commission (TNRCC)

Office of Legal and Regulatory Services	512/463-0491
Office of Waste Management	512/239-2104 Industrial and
Hazardous Waste Division	
Municipal Solid Waste Division	
Petroleum Storage Tank Division	
Pollution Cleanup Division	
Office of Water Resources Management	512/463-8246 Agriculture and
Rural Assistance Division	
Water Utilities Division	
Watershed Management Division	

Railroad Commission of Texas

Oil and Gas Division	512/463-6887
Surface Mining and Reclamation Division	512/463-6900
Environmental Services Division 512/463-6790	

Note: personnel, addresses, and telephone numbers, as well as extent of regulation, are subject to change.

Additional Information

Here are some additional AEG publications related to professional registration. Contact the AEG business office for current prices and shipping charges.

AEG Handbook of Geological Registration Laws. Second Edition, 1991. Volumes may be purchased individually. Volume I: General information, summary tables of features of state laws, and capsule summaries of every state law. Approximately 75 pages. Volume II: Reproduction of all state registration, certification, and definition statutes, with board regulations where available. Approximately 410 pages.

Supplement to Volume 11 of Handbook of Geological Registration Laws. Includes statutes for the states of Kentucky, Missouri, Oklahoma, Pennsylvania, and Wisconsin.

Proceedings, National Colloquium on Professional Registration for Geologists, 1990 Annual Meeting, Association of Engineering Geologists. Thirty-one papers and three abstracts presenting the views of individuals and organizations. 259 pages.

Published by the Association of Engineering Geologists.

For information, contact
Edwin A. Blackey, Jr., Executive Director Association of Engineering Geologists 323
Boston Post Road, Suite 2D
Sudbury, MA 01776

Telephone: 508/ 443-4639
FAX: 508/443-2948

Appendix 4

Source List

Contact information for many of the publishers and organizations mentioned in the text or cited in the reference list is given here for the convenience of the reader.

American Association of Petroleum Geologists
Division of Professional Affairs
P.O. Box 979
Tulsa, OK 74101-0979

American Geological Institute
4220 King Street
Alexandria, VA 22302-1507

American Institute of Professional Geologists
7828 Vance Drive, Suite 103
Arvada, CO 80003

American Psychological Association
1200 Seventeenth Street NW
Washington, DC 20036

American Society of Civil Engineers
345 East 47th Street
New York, NY 10017

American Water Resources Association
5410 Grosvenor Lane
Bethesda, MD 20814-2191

ASBOG
see National Association of State Boards of Geology

Association of Engineering Geologists
323 Boston Post Road, Suite 2D
Sudbury, MA 01776
voice 508/443-4639
fax 508/443-2948

Association of State Boards of Geology (ASBOG)
see National Association of State Boards of Geology
Association on Higher Education and Disability

AHEAD
P.O. Box 21192
Columbus, OH 43221-0192
(voice/TDD) 614/488-4972 or 800/247-7752.

CLEAR
Council on Licensure, Enforcement, and Regulation
Ms Pam Brinegar, Executive Director
Suite 410
201 West Short Street
Lexington, KY 40507 voice 606/231-1892
fax 606/231-1943

Educational Testing Service
P.O. Box 6508
Princeton, NJ 08541-6508
voice 609/921-9000

Natl. Association of State Boards of Geology ASBOG
P.O. Box 11591
Columbia, SC 29211-1591
voice 803/799-1047
fax 803/252-3432

National Council of Examiners in Engineering and Surveying
P.O. Box 1686
Clemson, SC 29633-1686
voice 803/654-6824

National Organization for Competency Assurance
1200 19th Street, N.W., Suite 300
Washington DC 20036-2401

Reg Review, Inc.
6555 Oakwood Drive
Oakland, CA 94611
voice 510/339-3771

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