

An International Review of Disciplinary Measures in Geoscience—Both Procedures and Actions

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[See table of contents](#)

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Article abstract

As professional communities around the world, geoscientists have in place disciplinary measures and, over time, instances have occurred which have required disciplinary actions to be taken against individuals. Geoscientists have specialized knowledge and provide expertise on which others rely for important decision-making. Geoscientists are best positioned to judge the scientific/technical and ethical merits of the work of other geoscientists. They are considered professionals and for that reason, society has placed the onus on the profession to govern itself. Consequently, it is important that appropriate disciplinary procedures are in place, that they are ever improving, and that the profession can and does act decisively when necessary.

This two-part review paper examines systems and measures to uphold the ethical conduct of geoscientists (Part 1), and studies actions taken against geoscientists in the last three decades (Part 2). It uses available information collected from the member organizations of the International Union of Geological Sciences' Task Group on Global Geoscience Professionalism as well as public sources.

Models used for the governance and self-regulation of geoscience practice vary globally across the same spectrum that is typical in other professions, with the choice of model varying to suit local legal contexts and societal needs and norms. Broadly, similar processes for complaints, investigation, and disciplinary decision-making (and appeals of decisions) are used. The types of charges that can be made for offences or allegations are similar. The ranges of applicable penalties vary depending on the extent of statutory power in place, but beyond this constraint, there are many parallels.

Ninety-two documented cases are identified where action has been taken against geoscientists globally since 1989. Of these, 40 relate to either non-payment of dues or fees (usually discontinuation of a membership or licence) or to non-compliance with Continuing Professional Development requirements. The remaining 52 are actions for more serious offences, resulting in penalties that are more substantial. These offences cluster into six categories: 1) falsifying data; 2) fraudulent billing and/or falsifying time sheets; 3) inappropriate behaviour towards others; 4) problematic geoscience work and/or technical deficiencies; 5) misrepresentation of findings, or the giving of unsupported opinions; and 6) mixed other offences. The most frequently used penalty in these cases is the reprimand. Next most frequent is revocation. Revocations include resignations with prejudice, where the geoscientist chose to resign their membership rather than allow the matter to proceed to discipline. Suspensions, requirements for remedial education and/or fines are also frequent penalties. Combinations of different penalties are common.

It is evident that rigorous procedures are in place in a number of countries and that they are being used to address the unprofessional behaviour of geoscientists. Transparency and the sharing of information about disciplinary actions between geoscience professional organizations (of all types) is important and should be encouraged. A global repository of geoscience disciplinary actions should be established and kept as up to date as possible.

PROFESSIONAL AFFAIRS



An International Review of Disciplinary Measures in Geoscience—Both Procedures and Actions

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SUMMARY

As professional communities around the world, geoscientists have in place disciplinary measures and, over time, instances have occurred which have required disciplinary actions to be taken against individuals. Geoscientists have specialized knowledge and provide expertise on which others rely for important decision-making. Geoscientists are best positioned to judge the scientific/technical and ethical merits of the work of other geoscientists. They are considered professionals and for that reason, society has placed the onus on the profession to govern itself. Consequently, it is important that appropriate disciplinary procedures are in place, that they are ever improving, and that the profession can and does act decisively when necessary.

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Ninety-two documented cases are identified where action has been taken against geoscientists globally since 1989. Of these, 40 relate to either non-payment of dues or fees (usually discontinuation of a membership or licence) or to non-compliance with Continuing Professional Development requirements. The remaining 52 are actions for more serious offences, resulting in penalties that are more substantial. These offences cluster into six categories: 1) falsifying data; 2) fraudulent billing and/or falsifying time sheets; 3) inappropriate behaviour towards others; 4) problematic geoscience work and/or technical deficiencies; 5) misrepresentation of findings, or the giving of unsupported opinions; and 6) mixed other offences. The most frequently used penalty in these cases is the reprimand. Next most frequent is revocation. Revocations include resignations with prejudice, where the geoscientist chose to resign their membership rather than allow the matter to proceed to discipline. Suspensions, requirements for remedial education and/or fines are also frequent penalties. Combinations of different penalties are common.

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RÉSUMÉ

À l'instar des autres organismes professionnels à travers le monde, les géoscientifiques possèdent leur protocole de mesures disciplinaires. Il est arrivé à quelques reprises que ces mesures aient été mises en application et que des sanctions disciplinaires aient été intentées contre certains individus. Un géoscientifique possède une connaissance spécialisée et livre une expertise qui, en retour, peut servir de référence dans la prise d'importantes décisions. Il n'existe aucun autre professionnel qu'un géoscientifique pour évaluer les mérites d'ordres moral, scientifique et technique d'un de ses pairs. Et c'est en se basant sur le professionnalisme de la géoscience que la société a imputé la responsabilité d'auto-gouvernance à la profession. Par conséquent, il est important que des mesures disciplinaires soient, non seulement mises en place, mais qu'elles soient également régulièrement revisitées. Et il est tout aussi important que la profession puisse agir et prendre ses responsabilités lorsqu'il est jugé nécessaire.

Cette étude qui comporte deux volets traite, en premier lieu, des systèmes et des mesures mis en place pour entériner le code de conduite des géoscientifiques et en deuxième lieu, elle examine les actions intentées à l'encontre des géoscientifiques durant les 30 dernières années. Notre ouvrage est basé sur des données et des renseignements recueillis d'associations membres du Groupe de travail de l'Union Internationale des sciences géologiques sur le Professionnalisme géoscientifique mondial ainsi que de sources publiques.

Comme on peut s'y attendre, les modèles qui sont utilisés pour la gouvernance et l'autoréglementation de l'exercice de la géoscience à travers le monde diffèrent de pays en pays, dépendant des contextes légaux des différentes régions, de leurs besoins particuliers et des coutumes sociales. En gros, les mêmes processus sont utilisés pour les plaintes, les enquêtes et les prises de décisions de sanctions (et les appels des jugements rendus). Les différents types de sanctions qui sont rendues pour les infractions ou allégations sont les mêmes. La nature des mesures punitives applicables demeure tributaire des pouvoirs statutaires en vigueur, mais à part cette contrainte, on a pu dresser entre elles plusieurs parallèles.

Nous avons identifié quatre-vingt-douze cas, documentés, où des actions ont été intentées contre des géoscientifiques à l'échelle mondiale depuis 1989. De ces 92 cas, 40 concernent, soit le défaut de paiement de cotisations ou frais d'adhésion (en général, il s'agit d'une suspension d'adhésion ou de droit d'exercice), soit le manque de conformité aux exigences des programmes de Développement professionnel continu. Les 52 cas qui restent ont trait à des offenses plus sérieuses qui ont donné suite à des sanctions plus graves. Les infractions ont été divisées en six catégories : 1) falsification de données ; 2) facturation frauduleuse et / ou falsification des relevés de temps ; 3) comportement inapproprié vis-à-vis d'autres personnes ; 4) situations de travail géoscientifique problématiques et / ou irrégularités d'ordre technique ; 5) fausse déclaration de résultats ou énoncé d'opinions sans preuves ; et 6) autres diverses infractions. La mesure punitive la plus répandue pour ce genre d'offenses est la réprimande. Puis, la deuxième plus répandue

est la révocation. La révocation peut inclure une démission volontaire sans appel, c'est-à-dire que le géoscientifique choisit de renoncer à son adhésion à la profession plutôt que de voir son cas jugé. D'autres sanctions qui reviennent souvent comportent des suspensions, des amendes et des ordres d'éducation complémentaire. On retrouve également fréquemment des combinaisons de sanctions différentes.

Il est évident qu'il existe des procédures rigoureuses dans de nombreux pays et que ces procédures sont donc mises en œuvre pour gérer les inconduites professionnelles des géoscientifiques. La transparence et le partage de l'information concernant les mesures disciplinaires entre tous les différents organismes professionnels géoscientifiques sont extrêmement importants et doivent être encouragés. Un répertoire mondial des mesures disciplinaires en géoscience doit être mis sur pied et doit être constamment mis à jour aussi souvent que possible.

INTRODUCTION

By way of example and to illustrate different disciplinary measures being put into effect—both procedures and actions—let us first consider three impositions of penalties against different geoscientists in different circumstances in the United States, Australia, and Canada.

In the first case (Oregon, USA) concerning the work of a hydrogeologist, the Final Order on Reconsideration from the Oregon Board of Geologist Examiners of October 2006 states, in part, that “...Licensee was grossly negligent in the way he performed his tasks as a geologist...” and “...Licensee’s work...was incompetent, demonstrating negligence.” It concludes: “Based upon the foregoing, the Final Order is affirmed as modified herein and Licensee’s registration to practice as a Registered Geologist in the State of Oregon is hereby revoked” (Oregon Board of Geologist Examiners 2006).

A July 2009 press release of *The Australasian Institute of Mining and Metallurgy* (AusIMM) reads in part, “...Geologist and former executive...permanently barred from reapplying for membership...The combination of lifetime ban and publication of penalty is the most serious sanction that the [AusIMM] can apply against a person who has breached the AusIMM Code of Ethics. The Code exists to uphold the integrity of the mining professions and public confidence in the professional conduct of members” (Australasian Institute of Mining and Metallurgy 2009). This matter concerned the tampering of assay values in the database for a gold prospect in China.

In Canada, the January 25–31, 2016 edition of *The Northern Miner*, Canada’s weekly mining newspaper, carried headlines, which read, in part, “...fined and sanctioned for QP work. Misconduct...reports were littered with errors...” The article goes on to describe a disciplinary action against a geoscientist taken and announced by the Association of Professional Engineers and Geoscientists of British Columbia (The Northern Miner 2016).

As geoscientists, we might think—well, so what? These matters were dealt with! Why should we care about actions against other geoscientists? As a professional community, it is suggested that geoscientists should and do care about such matters. Some reasons are listed below:

1. Geoscientists have specialized knowledge and provide expertise that others rely on for important decision-making.
2. Geoscientists are best positioned to judge the scientific, technical (and ethical) merits of the work of other geoscientists.
3. Geoscience is looked upon externally as a profession and for that reason, society has placed the onus on the geoscience profession to govern itself.
4. The geoscience profession around the world has systems and measures in place to uphold the ethical conduct of geoscientists.

A question that might follow is this one: How do these systems and measures compare around the world, how do they function, and are they effective? This paper reviews disciplinary measures in effect for geoscience practice in different parts of the world and is divided in two parts. Part 1 compares disciplinary procedures. Part 2 analyses some actions taken against geoscientists in the past three decades—at least all of those of which the authors have become aware! The paper concludes with observations and some recommendations to consider for the future. It is based on a presentation given at the 35th International Geology Congress, Cape Town, South Africa on 30 August 2016. It uses available information collected from the member organizations of the International Union of Geological Sciences' Task Group on Global Geoscience Professionalism, as well as public sources.

PART 1 – PROCEDURES

Organizational Models

In 2012, the International Union of Geological Sciences created the Task Group on Global Geoscience Professionalism (TG-GGP) with the purpose of providing an international forum of exchange on matters concerning professional affairs and ethical behaviour in the geosciences. Since its formation, seven countries and one continent have become involved in this task group, represented by either national or continental-level professional associations or consortia of local within-country or within-continent professional bodies (International Union of Geological Sciences' Task Group on Global Geoscience Professionalism: www.tg-ggp.org). Table 1 lists the current member organizations of TG-GGP. Using the member organizations of TG-GGP as a base, information was assembled from some, but not all of these organizations on different geoscientist disciplinary procedures in place around the world.

Teipel (2010) explains self-regulation of geoscience practice with reference to the USA-based Council on Licensure, Enforcement, and Regulation (CLEAR) classification scheme for different types of regulatory and self-regulatory systems in use for professions in general. The CLEAR scheme sets out a range of systems forming a spectrum (Fig. 1), from Voluntary Self-Regulatory Model systems on the one end, to full Government Agency Model systems on the other end, with Semi-Privatized Self-Regulatory Model systems positioned in between these extremes.

Table 1. Member organizations of the International Union of Geological Sciences' (IUGS) Task Group on Geoscience Professionalism and the countries that they represent (current as of August 2016).

Country	Member Organizations
Europe	European Federation of Geologists (EFG)
Canada	Geoscientists Canada/Géoscientifiques Canada
USA	American Institute of Professional Geologists (AIPG)
Australia	Australian Institute of Geoscientists (AIG)
Bolivia	Colegio de Geólogos de Bolivia (CGB)
South Africa	South African Council for the Natural Scientific Profession (SACNASP) and Geological Society of South Africa (GSSA)
Indonesia	Masyarakat Geologi Ekonomi Indonesia (MGEI)
Chile	Colegio de Geólogos de Chile

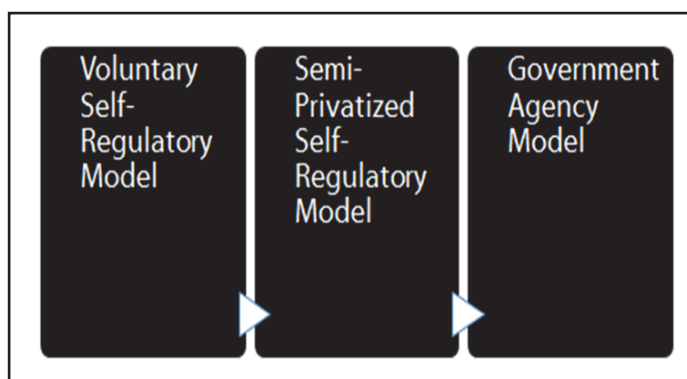


Figure 1. Self-Regulation – Regulation Spectrum derived from the 2006 classification of the Council on Licensure, Enforcement and Regulation (CLEAR) as interpreted for the geosciences by Teipel (2010).

Government Agency Model systems involve the direct regulation of a profession by government. They are rooted in either a law or an act, with statutory powers, that create the requirement to be licensed by government in order to undertake a particular professional activity. The administrative and legal support for the licensure process—and all that this involves—is provided by government, as part of government services. The powers of sanction have a legal footing and disciplinary powers extend to the power to impose a fine, in addition to typical practice-related penalties seen in other systems. Because having a licence is required by law in order to practice and the loss of a licence directly impacts upon a person's livelihood, disciplinary procedures are typically complex and a high level of proof is required before an action can be taken. This model, however, has limited jurisdiction in that it only provides practice rights within the geographic boundaries of the jurisdiction; and rights of investigation and sanction are limited to practice issues that may have occurred inside the geographic boundaries of the same jurisdiction.

On the other end of the spectrum, Voluntary Self-Regulatory Model systems have no government involvement at all.



These professional organizations are constitution and/or charter based, meaning that they have either no, or very limited, legal powers in their own right beyond those rights associated with being an incorporated not-for-profit society or institute. They are entirely self-funded and there is no administrative or legal support over and above what the organization can provide or acquire for itself. Powers of sanction are limited, with the maximum penalty being loss of membership and/or loss of right to title. That said, loss of right to title can have a major impact on a professional's ability to work, when certification membership 'in' (i.e. possession of title 'from') a particular association or institute is specified in local demand-side legislation as a requirement in order to undertake an activity requiring the skills of a geoscientist. At this other end of the spectrum, disciplinary procedures and rules of evidence may be less onerous, because membership is a privilege and not a right. In contrast to Government Agency Model systems, jurisdiction in Voluntary Self-Regulatory Model systems is unlimited geographically; jurisdiction extends to all members regardless of where in the world they are located and/or regardless of where a matter of concern about their practice may occur.

Examples of professional designations in geoscience that fall under the Voluntary Self-Regulatory Model are the Chartered Geologist (CGeol) of the Geological Society of London (2013), Registered Professional Geoscientist (RPGeo) of the Australian Institute of Geoscientists (AIG 1996), Chartered Professional (CP) of the AusIMM (where the professional designation is applied to mining industry professions in addition to geoscience), and Certified Professional Geologist (CPG) of the American Institute of Professional Geologists (AIPG; <http://aipg.org/membershipcategories>). Examples using the Government Agency Model are the Professional Geologist (PG) or Registered Geologist (RG) designations issued by those states in the USA with licensure requirements; these typically comprise the member states of the National Association of State Boards of Geology (http://asbog.org/state_boards.html; ASBOG states). Currently, there are 32 ASBOG states, including Puerto Rico.

In contrast, Canada and South Africa, follow the 'Semi-Privatized Self-Regulatory Model' that sits between the above systems. In Canada, provincial and territorial acts enable the creation of professional associations with statutory powers for the registration of Professional Geoscientists (PGeo.) [Géologue (géo) in Quebec]. However, although accountable to government, the associations themselves are fully self-administered and fully self-financed by the profession; there is no administrative support from government (Bonham 2010). In South Africa, enabling legislation creates a national council—the South African Council for the Natural Scientific Professions (2013a; SACNASP) to regulate all the applied science professions as Professional Natural Scientists (Pr.Sci.Nat). The Geological Society of South Africa (GSSA; http://www.gssa.org.za/?page_id=450), a voluntary model organization, provides the supporting expertise to SACNASP for those practising specifically as science professionals in the geosciences. Comparing the regulatory approaches using these three categories provides a context for the range of processes in place and allows for illustration of similarities and contrasts.

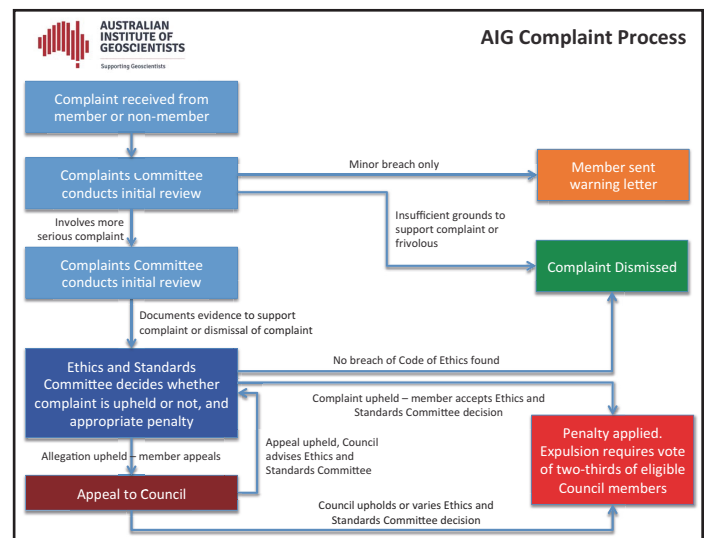


Figure 2. Flow chart of complaints process at Australian Institute of Geoscientists.

Complaints and Discipline Processes

Figures 2, 3, and 4 are example flow charts of the step-by-step complaints and discipline processes from three different professional organizations in different countries using different systems. Figure 2 illustrates the Complaints Process for the Australian Institute of Geoscientists (AIG 1996). Two separate committees are involved in a three step-process: a Complaints Committee (1 person—expanded as necessary) that investigates, and an Ethics and Standards Committee (1 person—expanded as necessary) that adjudicates and sets penalty. The Ethics and Standards Committee also has a review role at an initial stage. Appeals are handled by the AIG Council (14 persons). At the American Institute of Professional Geologists (Fig. 3) two different individuals and one committee are involved. A designated person, the Chair of the Ethics Committee, undertakes the initial review of a complaint; a second designated person, an appointed investigator, undertakes the investigation and proposes sanctions. If a hearing on the matter is requested, the Adjudicatory Board (a panel of 3 members) is then responsible for making the judgement. Appeals are heard by the AIPG Executive Committee (11 persons).

As an example for Canada, Figure 4 sets out the process in place at the Association of Professional Engineers and Geoscientists of British Columbia (APEGBC 2016; <https://www.apeg.bc.ca/For-Members/Complaints/Submit-a-Complaint-Against-a-Member>). Here there are two committees, an Investigations Committee (14 persons) and a Discipline Committee (14 persons). In British Columbia, at the point where notice of a disciplinary hearing is issued, there is an option for a three-person panel of the Discipline Committee to negotiate a Consent Order resolution with the member. Failing resolution, the matter proceeds to a formal hearing before a different three-person panel of the Discipline Committee. Appeals of decisions of the APEGBC Discipline Committee go to the British Columbia Supreme Court.

To uphold the impartiality of panels and to ensure that the public interest is served, increasingly we see the inclusion of

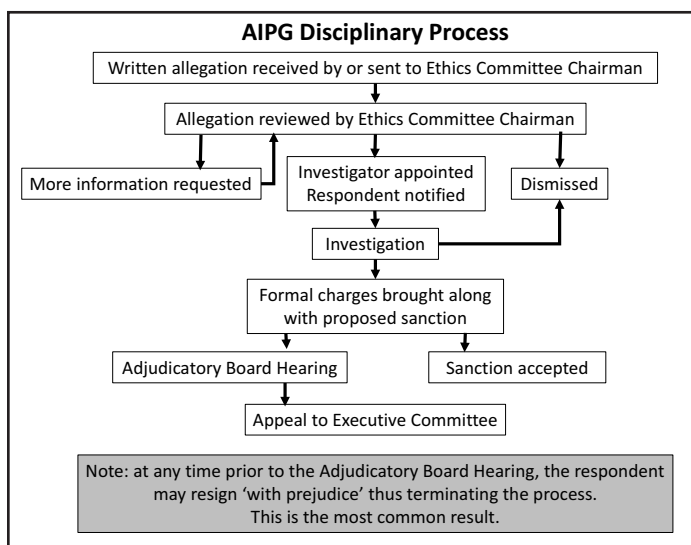


Figure 3. Flow chart of American Institute of Professional Geologists disciplinary process.

non-members (i.e. non-geoscientists) on disciplinary panels. For example, By-Law No.10 of the Association of Professional Geoscientists of Ontario (APGO 2003) titled 'Discipline Committee,' states "*The Chair of the Discipline Committee shall appoint several panels of not less than three members of the Discipline Committee comprised of at least one councillor who is a non-member appointee.*" The council of the APGO comprises 19 persons—16 professional members and 3 non-geoscientist government appointees. In general, there is a two-part structure in most processes, plus an independent higher-level mechanism for appeal.

Types of Offences (Allegations and Charges)

Across the different organizations representing all three regulatory and self-regulatory systems, offences are typically linked to breaches of the Code of Ethics, as one would expect. However, breaching a code of ethics is not the only area of potential offences, allegations, or charges. In some organizations, members may also be charged for incompetence or for negligence. Also, it should be noted that the term 'Code of Ethics' is not universally used, with some organizations using the term 'Code of Conduct'—for example, the Geological Society of London (2015) and South African Council for Natural Scientific Professions (2013b). In general, whether related to breaches of a code of ethics, incompetence or negligence, offences are usually characterized under the all-encompassing terms 'unprofessional conduct' or 'professional misconduct' (Fig. 5).

Most codes of ethics make paramount the duty of the member to uphold the public interest and protect public safety. One observation that can be made is that what a Code of Ethics actually says and how it is written is very important. Because it is the code that links to an organization's disciplinary mandate, the wording used can directly influence the range of charges permitted and the range of penalties that can be used against a member. Tepel (2012) makes this point

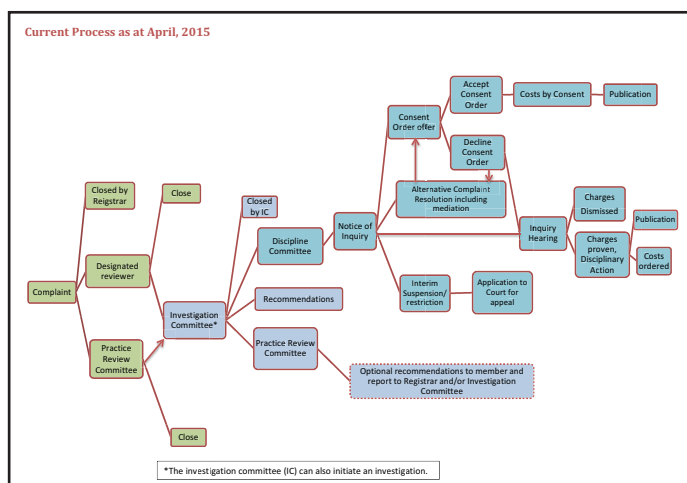


Figure 4. Flow chart of current process at Association of Professional Engineers and Geoscientists of British Columbia (APEGBC).

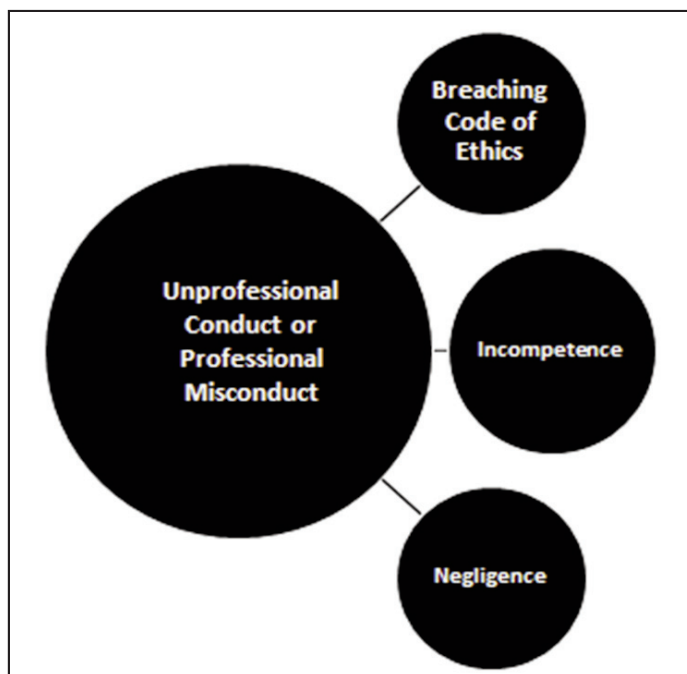


Figure 5. Types of offences (allegations, charges). Note: Code of Ethics is called Codes of Conduct at some organizations.

explicitly discussing the difference between 'shall' versus 'should' versus more aspirational wording, such as 'aspire to' or 'strive to.'

Range of Penalties

Comparing the range of penalties imposed as part of disciplinary actions across the different systems shows that penalties fall into four distinct categories (Fig. 6).

1. **Practice Penalties:** these are penalties that impose limitations or have an impact on the person's ability to act as a geoscientist; they include such sanctions as reprimands, restrictions (such as working under supervision), suspensions, or revocations of membership.



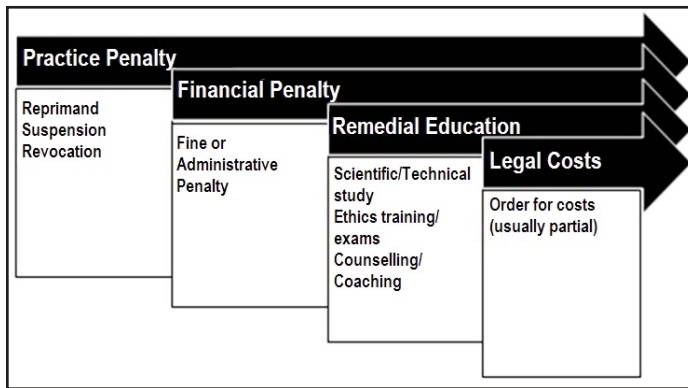


Figure 6. Principal penalties observed, falling into 4 main penalty categories.

2. Financial Penalties: these include fines, sometimes referred to as ‘administrative penalties.’
3. Remedial Education Penalties: these are requirements imposed as part of a penalty that seeks to rehabilitate the member. Examples include: designated scientific or technical study to address deficiencies in a person’s practice competencies, ethical training, and/or the need to pass (or re-pass) an ethics exam.
4. Legal Costs: although not strictly a penalty in legal terms, some systems allow for recovery of legal costs incurred by the association for its investigation work and for preparing and presenting its case against the individual. Usually, only partial costs can be claimed and costs are not commonly ordered.

Documentation on actions provides illustrations of the logic used in deciding the appropriate penalty for a particular offence or offences. A good example is a decision of APEG-BC (2014) concerning a professional engineer providing services relating to restoration of sub-surface contamination. The decision states clearly the principles used to guide the reasoning in reaching the penalty that was considered appropriate in the circumstances and it also reveals the order in which the principles were used. The principles cited were: (1) The need to protect the public; (2) The need to generally deter conduct of this nature by other members of the Association; (3) The need to specifically deter the Member from further conduct of this nature; and (4) The need to rehabilitate the Member. The same principles can be expected to apply in setting a penalty where there are findings of fault by a geoscientist in British Columbia.

PART 2 – ACTIONS

Research on Actions

Increasingly, decisions and actions taken by disciplinary committees are matters of public record or formal disclosure. Information available ranges from individual case references in association documentation, to notices in member magazines and newsletters, to press releases and public announcements, to tabulated records on websites. In many instances, particularly in Canada and the USA, the full written committee or licens-

ing board decisions are available as a matter of public record. These decision documents generally set out the charges, explain the findings, and state the penalties imposed.

For the purposes of this paper, each of the authors contributed all of the records of actions that each had as part of their own files, accumulated over the years. Contact was made with member organizations of TG-GGP and with some, but not all, professional geoscientist organizations associated with the TG-GGP member organizations, requesting information on actions taken. In addition, extensive searches were completed on websites, particularly the websites of state boards of geology in the USA, the provincial and territorial professional associations in Canada and the other TG-GGP member organizations. Recognizing that some organizations also self-regulate engineers, only those actions involving geoscientists were collected. In addition, only resolved actions that resulted in a finding of fault and imposition of a penalty were collected. Unsubstantiated complaints, matters that were dismissed, or matters that were still in process and not yet resolved were not included in the study. The study is confined only to actions taken by geoscientist professional associations and licensing boards. It does not include actions taken by other agencies or law enforcement against geoscientists, such as actions by securities commissions or civil or criminal courts. That said, reference is made to such outside actions or convictions where there was also an action taken against the same individual by the profession for the same or related offences.

Findings

A total of 92 documented actions against geoscientists were identified; these were set out in a tabular form. It is hoped this tabulated record of actions taken can be made available in the near future under the auspices of the IUGS’s Task Group on Global Geoscience Professionalism. Table 2 summarizes the 92 actions. The term ‘action’ refers to a finding of fault against a geoscientist member or licensee where a penalty was imposed. This includes actions where a person may have resigned ‘with prejudice;’ in other words, they forfeited their membership or failed to renew their licence rather than allow-

Table 2. Summary information on the disciplinary actions identified from the records examined by the authors. There are 92 actions in total, of which 52 are evaluated in this paper. The table also indicates the numbers of cases for which the individual is named and full documentation is available.

92 – Actions* dating back to 1989
12 – Suspensions/Revocations for non-payment of taxes/fees
28 – Reprimand/Administrative penalties for CPD+ non-compliance
52 – Disciplinary actions (other offenses)
36/52 – Individual is named
27/52 – Full decision documentation available

*Action = Finding and Penalty, including resignation with prejudice
+CPD: Continuing Professional Development

ing the matter to proceed to discipline. The actions listed are actions concerning the practice or activity of registrants; the list does not include enforcement situations where geoscientists were sanctioned and/or publicly cited for non-registration or for practising without a licence.

Twelve of the 92 actions were suspensions or revocations for non-payment of taxes or fees. Generally, these involve USA state PG licensees; they are assumed to represent non-payment of annual renewal fees. Another 28 are reprimands or penalties for non-compliance of annual Continuing Professional Development (CPD) reporting requirements, with the majority concerning PGs in the state of Texas (Texas Board of Professional Geoscientists 2016). For the purposes of this study, both of these sets of actions, totalling 40 in all, have been set aside and are not considered further. That said, it is important to point out that compliance with annual CPD requirements is an important requirement, and such offences are very worthy of note. The matter of continuing competence in one's professional skills and the professional's obligation to meet annual compliance documentation requirements is a founding ethical principle in most professions, not just in geoscience.

This leaves 52 actions for further consideration. Of these, 36 were actions where the individual was named; and 27 were actions where full disciplinary decision documentation is available. The public disclosure of names is a matter of organizational and/or public policy, which varies by jurisdiction. For this reason, we do not list any names in the text of this paper. This information may or may not be available from the organization in question, depending on their policies. Readers should contact these organizations or visit their websites for further information, if they require it. Figure 7 shows the distribution of these actions over time in five yearly intervals since 1985 and across 9 organizations. As can be observed, the AIPG, the provincial and territorial constituent associations of Geoscientists Canada, and the ASBOG states have the greatest numbers of recorded actions, with AIPG having the earliest records, dating back to 1989. Reports of actions for some ASBOG states may be greater than is shown. This is suspected because a number of USA states do not maintain records on their websites indefinitely (records generally only go back a decade or so) and not all states display disciplinary actions information on their website. The frequency of disciplinary actions in other parts of world for which there is data is noticeably lower over time as compared to North America.

Analysis

The 52 actions can be divided into 6 general categories based on the nature of the offences that lead to disciplinary action (Table 3). Note that some actions fall into more than 1 category. The categories include:

1. falsifying data (2 actions)
2. fraudulent billing and/or falsifying time sheets (5 actions)
3. inappropriate behaviour towards others (9 actions)
4. problematic geoscience work and/or technical deficiencies (9 actions)

	'85-'90	'90-'95	'95-'00	'00-'05	'05-'10	'10-'15	Since '15
AIPG	1	1	2	2	2	3	-
Canada (CA's)	-	2	1	4	3	10	-
USA (State Boards)	-	-	2	-	4	8	2
AusIMM	-	-	-	-	1	-	1
SACNASP /GSSA	-	-	-	-	-	-	-
AIG	-	-	-	-	-	1	-
GSL	-	-	-	1	-	1	-
EFG	-	-	-	-	-	-	-
IGI	-	-	-	-	-	-	-
TOTAL	1	3	5	7	10	23	3

Figure 7. Distribution of the 52 disciplinary actions discussed – over time and by organization.

Table 3. Further information on disciplinary actions investigated in this study. Note that individual cases may involve matters in more than one of the listed areas, so the total adds up to more than 52.

10 cases were subsequent to other convictions (securities related, or theft/embezzlement)

10 cases were related to work outside the geographic jurisdiction of the regulatory body.

Case offences fall into 6 categories

- 2 – Falsifying data
- 5 – Fraudulent billing/false time sheets
- 9 – Inappropriate behaviour towards others
- 9 – Problematic geoscience work/technical deficiencies
- 14 – Misrepresenting findings/unsupported opinions
- 20 – Mixed other offenses (includes 2 unstated)

5. misrepresentation of findings, or the giving of unsupported opinions (14 actions)

6. mixed offences (20 actions), including 2 actions where the offence was not stated

(Some examples of other mixed offences include failure to sign and seal a document when required to do so and abuse of a dues abatement program).

Interestingly, of the 52 actions, 10 were taken following other convictions against the same individual. The other convictions typically resulted from either breaches of securities law or criminal activities such as theft or embezzlement. In addition, 10 actions were extra-jurisdictional in nature, meaning the actions pertained to geoscientist activity that took place in another geographic region outside the typical 'home' jurisdiction or geographic location of the organization. It is worth noting that extra-jurisdictional actions were taken by both Voluntary Self-Regulatory Model and Semi-Privatized Self-Regulatory Model organizations; actions of this nature were not confined to Voluntary Self-Regulatory Model organizations, as might be expected.



One of the authors, Abbott, keeps a narrative record (AIPG 2017) that describes all the actions that have been taken by the AIPG against its professional members over time. In the context of other convictions commonly occurring against the same individuals, Abbott observes that when someone seriously violates the Code of Ethics, the violations are often multiple, egregious, and may result in additional civil or criminal actions.

Some Actions by Way of Example

To look a bit more closely at some of the actions, by way of example in the opening section, mention was made of the action by the Australasian Institute of Mining and Metallurgy in 2009. The major offence in this instance involved the falsifying (salting) of gold assay values in a drill-hole database for a mineral prospect in China. This case also involved other offences, and had previously been the subject of a significant order with penalty issued by the British Columbia Securities Commission (2009) for fraud and insider trading under the British Columbia Securities Act. The penalties in the securities order included permanent prohibitions on trading in securities, on acting as a director or officer, and on acting in a management or consulting capacity, or in engaging in investor relations. Several years later in 2012, the same matter went before criminal court in British Columbia, and the geoscientist was convicted for assay fraud and sentenced to 6 years in prison (Vancouver Sun 2012).

In 2006, in a case before the State of Wisconsin Geologists Section of the Examining Board of Professional Geologists, Hydrologists and Soil Scientists, a geologist employed by a consulting firm billed over US\$124,000 to a client, as a result of falsifying timekeeping records documenting the hours worked (Wisconsin Department of Safety and Professional Services 2006). The penalty was a 24-month suspension and the requirement to complete an ethics course and pay partial costs of \$1250. Moreover, before lifting the suspension, the geologist needed to appear before the Examination Board to answer questions.

Abbott (AIPG 2017) describes a double action that was taken by the AIPG in 1998, where a complaint about a member was received from a member of the organization's Executive Committee. He states, "*The investigation established evidence supporting some of the allegations but not others. Indeed, the investigation demonstrated that the complainant had himself made exaggerated and unwarranted statements in making the complaint. Some of the statements made by the respondent, which the complainant alleged to be false, were verified as being true. The investigation provided sufficient evidence to bring formal charges against both the original respondent and the original complainant.*"

Penalties

Figure 8 illustrates the frequency of usage of different penalties. Total usage adds up to a number larger than the 52 cases, because a single action against an individual may see the use of several different penalty elements together. The most frequently used penalty, at 23, is the reprimand (or admonishment as it is also called). Next, at 16, are revocations, which include

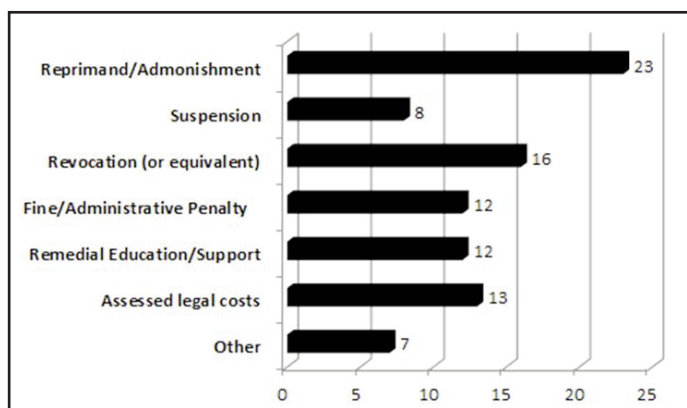


Figure 8. Usage of different penalty elements in the 52 disciplinary actions discussed.

6 instances of resignation with prejudice, where the geoscientist chose to resign their membership rather than allow the matter to proceed to discipline. Not all of the resignations with prejudice occurred in Voluntary Self-Regulatory Model organizations. Eight actions included suspensions. There were 12 where fines were imposed and 12 where the penalty required remedial training to be undertaken by the individual, including requirements to retake an ethics exam or complete some prescribed educational activity. Legal costs were imposed as part of 13 actions, whereby the individual had to pay all or part of the costs to investigate and resolve the matter. In 7 actions, the penalty was either of another form or is not known.

OBSERVATIONS AND RECOMMENDATIONS

This limited study indicates that rigorous procedures are in place and that they are being used to address the unprofessional behaviour of geoscientists. The models in use vary across the typical spectrum that one sees in other professions, with the choice of model varying to suit local legal and societal needs and norms. Jurisdiction is variable. Whereas the Voluntary Self-Regulatory Model organizations have universal geographic jurisdiction over their members, as would be expected, jurisdiction at organizations using the Semi-Privatized Self-Regulatory Model is also universal because these organizations, although statute-based, function as membership organizations and membership requirements extend to all members regardless of where in the world the member may reside or practice.

The Voluntary Self-Regulatory Model followed in Australia reflects the absence of legislation or government regulations covering geoscientific practice in most fields. There are several 'grey areas' including geoscientists engaged in geotechnical investigations and environmental geoscientists who submit reports to government in some states, where professional registration offered by the AIG and the AusIMM is required, but where the professional institutes themselves would be required to act against members in breach of required standards of practice under their codes of ethics. This Voluntary Self-Regulatory Model for Australia is under review by both the AIG and the AusIMM due to the manner in which both institutes are potentially exposed to litigation by a geoscientist, or the employer of a geoscientist, whose professional practice has

been affected by adverse judgements under the Institutes' ethics and standards processes. Professional associations representing members in other fields (e.g. engineering, accountancy, finance, etc.) can seek accreditation by Australia's Professional Standards Council (PSC), a Commonwealth government body, in order to access legislated limitations of liabilities provided by professional practice legislation in most Australian states. PSC accreditation would require AIG and AusIMM to mandate verifiable CPD by members (currently only a requirement of RPGeo and CP members), commit to continuous improvement of professional standards, and the implementation of a risk management program, subject to annual audits. These changes would occur, however, in an environment where self-regulation of professional geoscience would remain largely voluntary.

The study demonstrates that when geoscientists transgress, they are being disciplined. It also illustrates that the range of penalties is significant and includes remedial penalties to rectify skills deficiencies and rehabilitate geoscientists so they can regain fitness to practice going forward, in a safe and ethical manner. The naming of the geoscientist who is the subject of a disciplinary action is by no means universal, but naming is considered important for the following reasons:

1. It adheres to the principles of openness and transparency.
2. It demonstrates that a duty of care is taken by the organization, which builds public trust.
3. It serves as a strong deterrent to others.
4. It protects against re-appearance and re-offence.
5. It conveniently provides a unique action-by-action identifier.

On the second to last point, it has happened in some professions that individuals who offend and are sanctioned in one organization move and then become re-registered as a professional elsewhere in another organization, only to re-offend there.

In going through the process of assembling the information for this paper and in reviewing the findings, it is apparent there are some considerations for the future. In addition to comments below, please refer also to Abbott (2016). Although our work has identified a sizable number of actions, it is by no means a complete record of all actions that have occurred against geoscientists over time. Some organizations' websites have little or no information about disciplinary actions, whereas others have poor coverage on actions going back in time. Also, there are some large national professional geoscience organizations, such as in Spain and Italy, that were not contacted as part of this study. There is a pressing need to complete, to the greatest extent possible, an historical record of all disciplinary actions against geoscientists worldwide, over time, and to maintain it going forward.

The sharing of disciplinary actions information between our geoscience professional organizations (of all type) is important for the reasons stated above. It is recommended that geoscience professional organizations notify other geo-

science professional organizations about all actions taken, including resignations with prejudice. This includes government boards notifying professional associations of such matters, and vice versa. It is recommended that a global repository of geoscience disciplinary actions should be established and kept as up-to-date as possible. This should be accessible and searchable, by any interested party, at any time. It is suggested that the IUGS's Task Group on Global Geoscience Professionalism would be the appropriate agency to take on this task and serve as the permanent custodian of the repository.

CONCLUSION

This review shows that much information about disciplinary measures in geoscience and related procedures is available for North America, Europe, South Africa, and Australia, but there is little base-line information about procedures in other parts of the world. The majority of actions and the best information about actions come from North America, specifically the USA and Canada. It is not clear if the lower frequency of actions outside North America reflects less unprofessional conduct among geoscientists in other regions, or whether such behaviour is at similar levels, but not as commonly addressed through procedures or reported in the public domain. With geoscience being the global profession that it is, and with geoscientists thinking globally in all the scientific work they do as practitioners, we think that geoscience should establish and maintain a strong global network to share and exchange information on its disciplinary measures as a profession—including the procedures put in place and the actions taken over time.

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