

An Ethnomycological Review of Psychoactive Agarics in Australia and New Zealand

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Abstract — A comprehensive review is presented of the recreational and accidental ingestion of psychoactive mushrooms in Australia and New Zealand; 15 recognized species are considered from Australia and eight from New Zealand. Common epithets, potency levels, and methods of ingestion are discussed. Legal aspects involving the use of these psychoactive fungi are noted. In addition, medical and psychoactive effects of these mushrooms and treatment for psilocybian mushroom poisoning are described. Numerous case reports, with commentary, are also presented.

Keywords — Australia, mushroom poisoning, New Zealand, *Panaeolus* spp., *Psilocybe* spp., psilocin, psilocybin, psychoactive agarics

Mind-altering mushrooms of the *Psilocybe* (Fr.) Quelét and *Panaeolus* Quelét genera have been traditionally used in religious healing and curing ceremonies by native peoples in Mesoamerica for more than 3,000 years (e.g., Wasson 1980, 1957; Heim & Wasson 1958; Singer & Smith 1958; Wasson & Wasson 1957; Schultes 1940, 1939). Today, the secular, recreational use of these psychoactive fungi is widespread, especially in various regions of the United States (Ott 1978; Weil 1977), Canada (Unsigned 1982a; Guzmán et al. 1976; Oakenbough 1975; Commission of Inquiry Into the Non-Medical Use of Drugs 1973), Mexico (Ott 1975; Unsigned 1970), Great Britain (Young et al. 1982; Harries & Evans 1981), Europe (Stijve & Kuyser 1985), Scandinavia (Ohenoja et al. 1987), South America (Weil 1980, 1973; Pollock 1977-1978), Australia (Hall 1973; McCarthy 1971), New Zealand (Jansen, Allen & Merlin 1991; Jansen 1988, 1982), Samoa (Cox 1981), and Thailand (Allen & Merlin 1990b). The modern non-traditional use of these psychoactive mushrooms has been stimulated by reports in newspapers and magazines, by word of mouth, and also by the scholarly and popular journal publications of such authors as R. Gordon Wasson (e.g., 1957), Timothy Leary (e.g., 1968), Jeremy Sanford (e.g.,

1973), and Andrew Weil (e.g., 1980).

The present article reviews the history of accidental and purposeful use of psychoactive agarics in Australia and New Zealand, utilizing information gathered from reports in the scientific literature, news items appearing in the popular press, and personal communications with medical and law enforcement professionals in Australia and New Zealand. The chemical compounds and mycological identification of the mind-altering mushrooms known to have been ingested in Australia are also discussed. In addition, the legal aspects involving their use in Australia and New Zealand have been investigated and are described. Finally, there is a description and analysis of the medical and psychological results of both the accidental and deliberate ingestion of these psychoactive agarics in Australia and New Zealand during the past 50 years.

NONTRADITIONAL RECREATIONAL USE

Four agarics, *Stropharia* (*Psilocybe*) *cubensis* (Earle) Singer (see Figure 1) and/or *Psilocybe subcubensis* Guzmán, *P. subaeruginosa* Cleland (see Figure 2), and *Copelandia cyanescens* (Berk. & Br.) Singer (see Figure 3), all dung-inhabiting species containing the hallucinogenic substances psilocybin and psilocin, are the most common species of psychoactive mushrooms employed for nontraditional purposes by individuals in Australia (Southcott 1974; Hall 1973). In New Zealand, the most commonly used species appear to be *C. cyanescens* and to a lesser degree *P. semilanceata* (Fr.:Secr.) Kummer

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Figure 1. *Psilocybe cubensis* (Earle) Singer: Gold Tops. (Photo by John Allen).

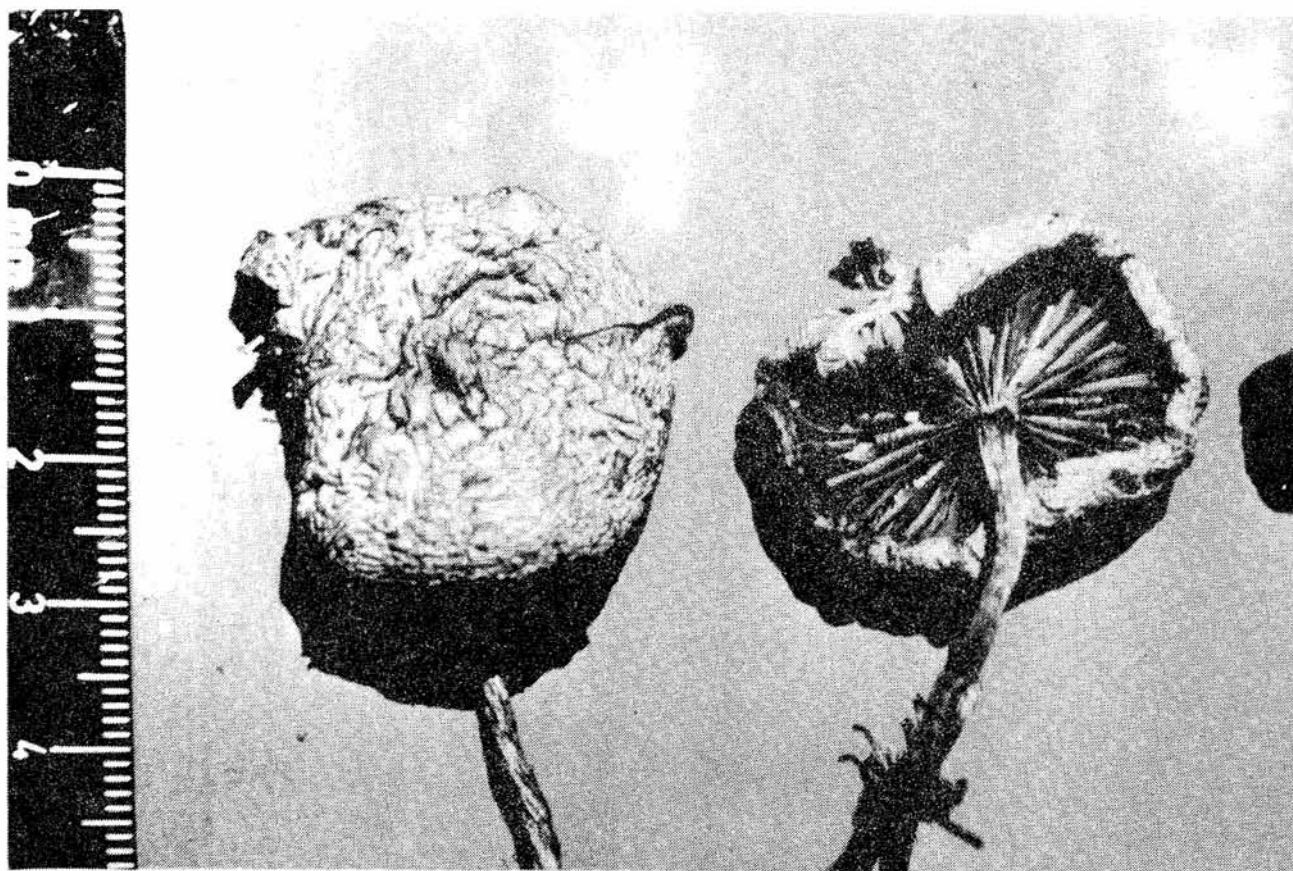


Figure 2. *Psilocybe subaeruginosa* Cleland: Gold Caps. (Photo by R.V. Southcott).



Figure 3. *Copelandia cyanescens* (Berk. & Br.) Singer: Blue Meanies. (Photo by John Allen).

(Jansen 1989). *P. cubensis*, the most popular of these species, is well known throughout much of the world (Badham 1984). While some mycologists have placed this dung-inhabiting agaric in the genus *Stropharia* (Fr.) Quelét, others have classified it in the genus *Psilocybe* (Fr.) Quelét. For clarification, the authors of the present article will refer to this species as *P. cubensis*.

CATTLE AS A POSSIBLE DISPERSAL MECHANISM FOR PSYCHOACTIVE DUNG FUNGI

The first livestock to arrive in Australia were brought from the Cape of Good Hope in 1788, and included two bulls and five cows along with other domesticated farm animals. By 1803, the government owned approximately 1,800 cattle, most of which were imported from the Cape, Calcutta, and the west coast of America (Unsigned 1973). It was during this period that many of the psychoactive agarics mentioned in the present article probably first appeared in Australia. According to Cleland (1934: 19), "fungi growing in cow or horse dung and confined to such

habitats, must in the case of Australia, all belong to introduced species." It is believed to have been the South African dung beetle that actually spread the spores. Citing Guzmán (1983), Watling (1989) stated that "it must be remembered that fungi can change substrate preferences and there are coprophilous fungi on kangaroo droppings." In a personal communication to one of the present authors (Allen), Schultes (1988) indicated that *Psilocybe cubensis* could also occur in the manure of deer.

The ingestion of naturally occurring fungi by cattle and other domesticated or wild ruminants in Australia (e.g., horses, sheep, pigs, goats, deer) has been noted (Cleland 1934). This appears to be common among grazing ruminants, thereby providing a biological process for the distribution, dispersal, and eventual germination of spores within the stomach of the carrier, resulting in fruiting bodies that then appear in fresh or partially decomposed manure.

Cleland (1934), who recognized that animals had been observed on occasion ingesting wild mushrooms, reported that "certain cattle had been seen to eat them with relish and even to seek the mushrooms out." In Australia, certain



Figure 4. *Psilocybe semilanceata* (Fr.:Secr.) Kummer: Liberty Caps. (Photo by John Allen).

genera belonging to the gasteromycetes and appearing after brush fires readily attract wallabies, bandicoots, and even rabbits, who vigorously consume the fungi they find. Most snails and slugs as well as many species of deer are known to have a fondness for naturally occurring fungi, especially *Amanita muscaria* (L.:Fr.) Hooker.

The process by which dung fungi readily appear in fresh and/or partially decomposed manure occurs from the ingestion of spores that appear on the surrounding vegetation and from the actual consumption of fungi by cattle who consume them when grazing. Cleland (1934) suggested that "it seems almost certain that the spores from such species, [which are] produced by the millions, become deposited on the surrounding vegetation and so get ingested. They probably pass through the alimentary canal intact — it is quite likely that their germinating powers may be increased during the passage — and so the dung is already seeded by the spores when it is passed. This would account more satisfactorily for the facility with which manure develops a crop of fungi than by looking to chance distribution of the spores by air after disposition of the manure."

More than half of Australia's beef cattle are situated in the coastal areas of Queensland and New South Wales;

and the 20- to 30-inch (500-750 mm) rainfall belt of Queensland, New South Wales, and Northern Victoria generally provides an adequate climatic environment for the growth of psilocybian fungi, especially after heavy rains. Therefore, Margot and Watling (1981) speculated that "*P. cubensis* was introduced into Australia accidentally by early settlers along with their livestock." The same dispersal mechanism probably applies to *C. cyanescens*, *Panaeolus subbalteatus* Berk. & Br., and several additional species known to occur in or around the dung of other ruminants (Cleland 1934). This includes *Psilocybe semilanceata* (Fr.:Secr.) Kummer (see Figure 4) and *Panaeolina foenisecii* (Pers.:Fr.) Maire; the latter is commonly referred to as the Haymakers mushroom (Ola'h 1969). (In England, this species is referred to as the Haymaker or Brown Hay Cap.) Margot and Watling also claimed that the "use of *P. cubensis* as a recreational drug tends to confirm the belief that [some] farmers in early times [may have] added one or two basidiomes [gill mushrooms] to a meal to liven it up (and still do)." While cattle are raised in all Australian states and in the central lowlands, individuals have been known to export these psychoactive species to various areas in Australia from areas

where they were collected (Hall 1973; McCarthy 1971).

The reported locations for more than a dozen species of psychoactive fungi in Australia and New Zealand that most likely have been used at one time or another for recreational purposes are documented in the appendix. Most users of the psychoactive fungi (or any other species that might be picked for their suspected psychoactive effects) have very little knowledge of their scientific names. Instead, many users have given local epithets to their favorite species, which are commonly used by those who collect and ingest them. Some of these popular names are now becoming well known by users outside of Australia.

COMMON EPITHETS

"Magic mushrooms" is the most common term applied to psychoactive fungi. It was invented by a *Life* magazine editor in 1957 (Stafford 1982; Wasson 1957). *Psilocybe cubensis* and/or *P. subcubensis* are known locally by users in Australia as Golden Tops or Gold Caps (Morton 1982; Australian Royal Commission 1980; Southcott 1974). In Mexico and the United States, as well as in other countries where psychoactive mushrooms are ingested, *P. cubensis* is often referred to as the San Ysidro or Palenque mushroom (Ott 1978; Pollock 1977-1978) and Golden Tops (Ott 1975). The Australian epithets may have been given to this species by members of a local group of surfers who frequented the Gold Coast region of Eastern Australia. However, some of these names have apparently been used to describe several different species of *Psilocybe* that have been taken by local users in Australia. *P. cubensis* and/or *P. subcubensis* are not known to occur in New Zealand.

Those who ingest *Copelandia cyanescens*, known in Australia and New Zealand as Blue Meanies, also refer to this species as Blue Legs, Golden Tops or Gold Caps (Morton 1982; Southcott 1974). The latter two nicknames, as well as Dimple Tops (Stevens & Gee 1977) and Cone Heads (Stapleton 1981) are common terms applied to *C. cyanescens* by users in the Hawaiian Islands (Allen & Merlin 1989). Some of these same popular names have also been used by visiting surfers from both New Zealand and Australia when describing the macroscopic characteristics of *C. cyanescens*. These same surfers visiting the north shore of Hawaii have reportedly ingested mushrooms prior to surfing, as do many of the locally based surfers (Pollock 1974).

The epithet Blue Meanies refers to the relative potency of the species and the intense blue oxidation (indicating the presence of psilocin) caused by damage to the stem when the mushroom has been bruised by human handling (Pollock 1977-1978; Southcott 1974), and Blue Meanies is connected with the Beatles' film *Yellow Submarine*. Gold Tops or Golden Caps often refer to the

color of the pileus of both *P. cubensis* and *C. cyanescens*, which are hygrophanous (changing color when drying); these two nicknames are most likely used to describe *P. subaeruginosa*.

In the United States (Weil 1980), Canada (Oakenbough 1975), and Great Britain (Young et al. 1982; Harries & Evans 1981), *Psilocybe semilanceata* is often referred to as Liberty Caps. This epithet is derived from an emblem of the French Revolution. It is adapted from the shape of the soldier's helmet (the Phrygian bonnet) of the French Republic, which became a symbol of the Republic (Watling 1988; Weil 1977). Whether or not this epithet is used in Australia is unknown at the present time (see case 29 below). In New Zealand, the term "magic mushroom" is certainly more popular than any other to identify psychoactive fungi.

PUBLIC AWARENESS OF PSILOCYBIAN FUNGI

McCarthy (1971) suggested that the general public in Australia as well as members of its drug-using subculture first became aware of the psychoactive properties of these psychoactive agarics by visiting surfers from either New Zealand or the United States who most likely provided ethnomycological information to local surfers. McCarthy reported that the use of psychoactive fungi and 21 other drugs was well demonstrated during a survey on drug abuse that was conducted in Southern Queensland during 1969. This survey relied on interviews of 51 people belonging to "the surfer subculture at local beach resorts." McCarthy felt that "although the survey involved surfers and their female friends, there is no suggestion that the use of these drugs is confined to this group, which constitutes but a proportion of the [Australian] young drug taking community." It is thus likely that word of mouth made a significant contribution to the increase in the use of these fungi.

In addition, many early users of these fungi in Australia may have first become aware of their mind-altering effects by reading the published literature or the many news items appearing in the popular Australian press during the late 1960s and early 1970s. These news items often described the accidental or deliberate intoxication resulting from ingestion of *P. cubensis*, *P. subaeruginosa*, and *C. cyanescens*. For example, Southcott (1974) provided an account regarding the use of these mushrooms by teenagers at a local high school in Brisbane: "... children at a suburban school are getting high on mushrooms called 'Gold Tops.' The mushrooms are common along the Brisbane River near Toowing High School, and children in search of 'kicks' have been experimenting with them (Unsigned 1972)." It would be obvious to anyone who read this news item that those searching for psycho-

active mushrooms would be able to find them.

There is yet another factor that may have played a significant role in promoting interest in the psychoactive fungi of Australia. Some mycophilic individuals may have been aware of Wasson's personal account of his adventurous rediscovery of a hallucinogenic mushroom cult among the Mazatec Indians of Southern Mexico. Wasson (1957) reported the ceremonial use of these mushrooms as divinatory substances by the Mazatecs and other native peoples in Oaxaca State. This journalistic report of Wasson's research expedition also appeared in an international edition of *Life* magazine (June 10, 1957), providing many people with the incentive to seek out and eventually experiment with these mushrooms. The media may have also played an unintentional role. For example, in the Pacific Northwest of the United States, local radio stations and newspapers often inform the public of the annual arrival of mushroom season.

PSYCHOACTIVE POTENCY OF AGARIC SPECIES

The majority of adverse physical or psychological effects produced by these mushrooms generally result from inappropriate set and expectation (Grinspoon & Bakalar 1981; Weil 1980; Leary, Litwin & Metzner 1963) or because of improper dosage that may vary considerably among consumers, different fungi species or even within an individual species (Beug & Bigwood 1982).

The question of dosage is confused by the variation in the source of the psychoactive fungi that is consumed. For example, when picked and eaten from its natural dung habitat, *Psilocybe cubensis* produces a relatively mild mind-altering experience, which is evident from the large amounts of fresh specimens needed to achieve a threshold experience. However, when grown in vitro, *P. cubensis* apparently can produce a more potent strain capable of inducing a very intense visual, sometimes quite disturbing, experience (Stein 1958).

This low potency for *P. cubensis* growing in its natural habitat has been confirmed by Margot and Watling (1981) who were surprised by the comparatively small amounts of psilocybin and psilocin that they extracted from wild specimens collected from five different locations in Queensland. This suggests that a much larger dose would be required to produce significant hallucinations. It is possible that the chemicals degenerated between the time that they were harvested and the time of analysis. However, it should be noted that a strain of *P. cubensis* producing different flushes (i.e., harvests) will vary somewhat in potency between flushes (Bigwood & Beug 1982).

Most recreational users of *P. cubensis* (ingesting fungi grown in vitro) require a dosage of 1 to 2 g of dried mushrooms to produce an altered state of consciousness. A clinical

dose for *P. cubensis*, on the other hand, had previously been reported as ranging from 3 to 5 g of dried material (Lincoff & Mitchell 1977; Haard & Haard 1975; Stein 1958). This dose would be comparable to the amount of fungal material consumed for religious purposes in a Mazatec healing ceremony (Ott 1978). Bigwood and Beug (1982) found that "the level of psilocybin and psilocin varies over a factor of 4 among various in vitro cultures of *P. cubensis*, while specimens from outdoors varied ten-fold."

A fresh dose of *P. cubensis* in Australia, as elsewhere, would vary from one to two large mushrooms weighing up to as much as one fresh ounce or as many as 25 to 50 small mushrooms equaling the same weight (Guzmán 1981; Schroeder & Guzmán 1981). Ott (1978) noted that he observed "the ingestion of from 0.5 g to 5.9 g dried weight (10 g to 40 g fresh)" of various species of *Psilocybe*. The dose for *P. subcubensis* would be the same as for *P. cubensis*.

The usual dose for *C. cyanescens* required to induce psychedelic effects ranges from one to three large specimens (cap diameter c. 5 mm) or as many as five to 10 medium-sized mushrooms (cap diameter c. 2.5 mm). However, tolerance to this species may occur with continued use, and some who consume large amounts of this mushroom have reportedly ingested as many as 50 to 200 fresh specimens of various sizes (Pollock 1974; Southcott 1974). The dose for *P. subaeruginosa* is approximately the same as that given for *P. cubensis*: one to three large specimens, four to six small specimens, or 1 to 2 g dried material (Guzmán 1988). *Panaeolus subbalteatus* requires at least 28 g fresh (10 to 20 or more mushrooms) or as many as 2 to 5 g dried material (Weil 1980, 1977; Allen 1978b; Haard & Haard 1975). For *Psilocybe semilanceata*, the threshold psychoactive dose is reported to be 9 to 14 g fresh (approximately 20 to 40 mushrooms) or 1 g dried (Weil 1980; Allen 1978b; Haard & Haard 1975).

Gymnopilus spectabilis (Fr.) Singer is now considered a synonym of *G. junonius* (Fr.) Orton and the dose for this species has been reported as being from four to eight fresh ounces (Friedman 1986; Lincoff 1980; Pollock 1980) (112-224 g fresh). According to Watling (1989), the Australian form is probably Subsp. *pampeanus* (Speg.) Singer. Threshold doses for *G. purpuratus* (Cooke & Masse) Singer, *Psilocybe australiana* Guzmán & Watling, *P. eucalypta* Guzmán & Watling, *P. kumaenorum* Heim, and *P. tasmaniana* Guzmán & Watling are unknown at the present time, and the suspected psychoactive properties of *P. coprophila* (Bull.:Fr.) Kummer and *Panaeolina foenicisii* Maire remain doubtful, as does the appearance of *P. collybioides* Singer & Smith in Australia (Guzmán 1988).

Mushroom users apparently sell the above-mentioned psychoactive species among their friends and close asso-

ciates rather than to strangers on the streets. In 1973, psychoactive mushrooms in Australia and New Zealand ranged in price from \$5 to \$10 per single dose (usually 1 g dried) and up to \$25 or more for an ounce (28 g) of fresh fungi (Hall 1973). These figures appeared to be a standard price throughout much of the North American continent and Europe.

METHODS OF INGESTION

Psychoactive mushrooms are either eaten fresh (which supposedly produces the most powerful and intensely visual experience) or dried and consumed at a later date (Lincoff & Mitchell 1977; Haard & Haard 1975). Some users freeze mushrooms for later use, while others put them in capsules for resale (Weil 1980; Ott 1978; Pollock 1977-1978; Hall 1973). Mixing the psychoactive fungi in milk shakes (known as Mushroom Smoothies) or tea are common methods employed by users who dislike the natural taste of the mushrooms (Pollock 1977-1978). Cooking the mushrooms in a soup, stew or omelette to alleviate the acrid taste of psilocybian fungi has also been noted (Weil 1980; Ott 1975; McCarthy 1971).

Jacobs (1975) reported that users in the southeastern United States who consume *Psilocybe cubensis*, "boil the mushrooms in water to remove the active ingredients [that are soluble in hot water]" and then "use the water to prepare foods such as rice or soup, and discard the remains of the mushrooms." Furthermore, Jacobs stated that "this is the basic recipe for hallucinogenic beverages such as magic Kool-Aid." Chocolate and honey are also employed by recreational users for use with mushrooms (Zimmer 1986). Watling (1989) reported that during his stay in Indooroopilly, Queensland, in 1974 he "saw many 'for-aying' groups of young people looking for *Psilocybe* [spp.] in fields, and was told by one user that *Psilocybe* was packed in honey to preserve, transport and export." Honey is more frequently used in New Zealand for actual storage. Mushrooms in honey preserve their potency much better than those that are dried or frozen, especially if placed in honey just after being picked. It has been noted that both of these substances (chocolate and honey) were served with mushrooms during Aztec ceremonies, coronations and festivals (Wasson 1980; Wasson & Wasson 1957; Schultes 1940, 1939; Kingsborough 1848; de Sahagun 1590).

CHEMICAL IDENTIFICATION OF AUSTRALIAN PSYCHOACTIVE FUNGI

While Australian mycologists have long been interested in the accidental ingestion of poisonous mushrooms by unsuspecting foragers, since the late 1930s they have been aware that some mushrooms induce unusual psycho-

logical reactions in humans when eaten, and that individuals who had consumed these mushrooms also reported disturbances of vision. The earliest report of a suspected psychoactive intoxication from a mushroom in Australia occurred in the early 1930s (Cleland 1934); however, the first mycological identification of a mind-altering fungus in the country did not occur until more than 20 years later when Aberdeen and Jones (1958) first reported their description of *Psilocybe cubensis* collected from Springbrook.

Psychoactive fungi, "containing psilocybin, psilocin, or related alkaloids with an indole nucleus and producing, by an oxidative process, a blue pigment" (Singer 1978), are known to occur in at least 12 different genera of fungi, primarily belonging to various species of *Psilocybe* and *Panaeolus*. The principle psychoactive agents found in these fungi are indoles known as psilocybin and its dephosphorylated derivative psilocin. Badham (1984) referred to the hypothesis that suggests that "the activity of psilocybin may be associated with its structural similarity to serotonin," which is a neurotransmitter (e.g., Hofmann 1980; Chilton 1978; Lincoff & Mitchell 1977).

It should also be noted that the presence of both psilocybin and psilocin may be accompanied by their monoanalogue baecocystin and its *bis*-demethylated analogue norbaecocystin, which are both known to be psychoactive (Schultes & Hofmann 1980). Many of these species are also known to contain 5-hydroxytryptamine (5-HT, serotonin), tryptophan, and other related indole compounds (Hall 1973). Psilocybin is water soluble, while psilocin is not; both may be extracted from mushrooms with methanol (Margot & Watling 1981; Perkal et al. 1980).

OTHER SUSPECTED AUSTRALIAN PSYCHOACTIVE FUNGI

Amanita muscaria (L.:Fr.) Hooker is reportedly used in the United States as a recreational drug source (Weil 1980; Ott 1978). Dr. Malcolm C. Hall, formerly of the Commonwealth Police Force of Canberra, Australia, referred to a few instances of its use by members of the drug subculture in New Zealand (Southcott 1974). This species contains ibotenic acid and muscimole, two psychoactive substances. *A. muscaria* occurs in Australia and New Zealand, and has been used for its psychoactive effect.

The major limitations on the use of *A. muscaria* is the severe nausea and violent vomiting as well as drooling and sweating that follow ingestion (Jansen, Allen & Merlin 1991). In New Zealand, attempts have been made to reduce these effects by peeling the red skin from the cap and by drying the mushrooms in the sun for several days. These preparatory methods have not proven to be successful, and hence the mushroom is ingested only by the poorly informed, although it is quite widespread in its distribution.

In fact, the consequences of ingestion are so unpleasant that one is led to speculate that the *A. muscaria* employed by Siberian tribesmen (Stafford 1982) contains a different balance of chemicals to that found in New Zealand, which almost no users are prepared to consume more than once. It is also worth noting that ibotenic acid is a potent neurotoxin, causing neuronal death via a mechanism known as excitotoxicity (Schwartz et al. 1987).

Margot and Watling (1981) examined specimens of *Psilocybe coprophila* collected near Mt. Lofty and Bridgewater in Queensland to investigate its potential psychoactive properties. Their chemical examination found that the specimens they analyzed contained unknown indole compounds related to psilocybin (see Appendix). *Mycena pura* (Fr.) Quelét is another mushroom occurring in Australia that is suspected to contain psychoactive substances (Shepherd & Hall 1973). A species of *Mycena* from the Pacific Northwest of the United States known as *M. cyanorrhiza* Quelét is also mentioned as being psilocybin positive. Southcott (1974) also mentioned *Schizophyllum commune* Fr. as containing hallucinogens. Watling (1989) labeled this species as toxic, and according to Weil (1988) this species is not psychoactive.

Another species of fungi suspected as a latent psilocybian is *Panaeolina foenisecii* Maire. Cleland (1934) was the first to identify *P. foenisecii* collected in Australia (see Appendix). At the time of his identification, he listed this species as being *Psilocybe foenisecii* (Pers.) Fr. (L., Foenisecia, hay-harvest), and made no mention of its edibility. The question of the suspected psychoactive properties of *P. foenisecii*, a mushroom that allegedly caused inebriation in three young children (Southcott 1974; Miller 1972; Holden 1965), three teenagers (Cooles 1980), and two elderly women (Allen 1988a), is confused by the conflicting observations of the investigators and mycologists who have studied this species. There is disagreement regarding the presence of psilocybin and psilocin in this species. Southcott reported an inebriation involving a three-year-old girl who allegedly consumed this species on numerous occasions, each time resulting in terrifying visual disturbances (see case 20 below). Australian specimens of *P. foenisecii* collected near Canberra and analyzed by R.W. Rickards (Southcott 1974) were reported as being psilocybin negative.

Watling (1979) collected specimens of *P. foenisecii* in 1974 from Western Australia and described the suspected poisoning in South Australia of a two-year-old girl, a case originally reported by Southcott. He also briefly mentioned Holden's report (1965) of an alleged poisoning of a three-year-old child in Great Britain and believed that "because of its widespread distribution, and its frequency on lawns and in parks, *P. foenisecii* is likely to cause poisonings, especially in young children." Stijve, Hischenhuber and Ashley (1984) analyzed a collection of *P. foenisecii* from

Australia that were found to be psilocybin negative.

IDENTIFICATION OF AUSTRALIAN PSYCHOACTIVE FUNGI

As noted above, Aberdeen and Jones (1958) were the first to document the existence of a known psychoactive agaric, *Psilocybe cubensis*, in Australia. This was accomplished while they were conducting a study of the chemical properties of *Panaeolus ovatus* Cooke & Masse (Cooke 1889), a fungus reportedly responsible for a number of accidental intoxications in Australia. Aberdeen and Jones, who were commissioned to undertake this chemical investigation, had assumed that these mushroom-poisoning incidents in Australia were not caused by *P. ovatus*, but instead were due to *P. cubensis*. They cited several reasons that led them to that conclusion. Later, however, Southcott (1974) suggested that some species of *Panaeolus* were indeed the cause of the hysteria outbreaks, while Pollock (1976) believed that *Copelandia cyanescens* was the fungus responsible for at least some of the hysteria intoxications that were attributed to the ingestion of *P. ovatus*, which is a fungus now known to be synonymous with *P. antillarum* (Fr.) Dennis (see Figure 5).

Twelve years after Aberdeen and Jones had established the presence of a psilocybian agaric on the Australian continent, Picker and Rickards (1970) reported that they had found psilocybin but no psilocin in *Psilocybe subaeruginosa* specimens collected in Australia. This second record of the presence of psychoactive mushrooms in Australia and the development of recreational ingestion during the 1960s and 1970s prompted a number of scientific and governmental studies of the Australian mycoflora. The general objective was to identify the occurrence of other suspected psychoactive mushrooms that were indigenous or naturalized in this large country.

Hall (1973) reported the occurrence of *Psilocybe collybioides* Singer & Smith and *P. subaeruginosa* from Tasmania, *P. cubensis* from Queensland, and *Copelandia cyanescens* from Australia, while noting at the same time that his investigations of the *Panaeolus* spp. were incomplete. In addition, Shepherd and Hall (1973) listed the following species as mind altering and possibly being ingested by collectors of Australia's wild psychoactive fungi: *C. cyanescens*, *P. collybioides*, *P. cubensis*, *P. subaeruginosa*, *P. semilanceata*, *Gymnopilus spectabilis*, and *P. subbalteatus*. The latter occurs naturally in Australia, is psychoactive, and is known to be used as a recreational drug in the Pacific Northwest of the United States (Weil 1980, 1977; Ott 1978; Ott & Guzmán 1976; Pollock 1976). Southcott (1974) reviewed the literature and reported that *P. cubensis*, *P. subaeruginosa*, *P. collybioides*, *C. cyanescens*, and *Panaeolina foenisecii* had apparently been responsible for a number of accidental mushroom poison-



Figure 5. *Panaeolus antillarum* (Fr.) Dennis: the so-called "hysteria fungus." (Photo by John Allen).

ings that occurred in Australia between 1941 and 1973.

A taxonomic investigation of Australian agarics was later carried out by Guzmán and Watling (1978) who concluded that the identification of *Psilocybe collybioides* by Hall (1973) and Southcott (1974) was inexact (see Appendix). Guzmán and Watling also suggested that *P. coprophila*, a dung-inhabiting fungi found in Australia, might possibly be psychoactive (see Appendix). In addition, they verified the occurrence of *Panaeolina foenicisii*, *Psilocybe semilanceata*, and *P. subaeruginosa* in Australia, and suggested that *P. kumaenorum* Heim, a species previously recognized only from New Guinea, might also occur in Australia because of the existence of the appropriate ecological conditions along the Gold Coast area of New South Wales.

Guzmán and Watling also reported the discovery of three additional *Psilocybe* species and suggested that these newly described species might also be hallucinogenic. Their assumption was based on the following macroscopic characteristics, which they observed in freshly collected specimens: *Psilocybe eucalypta* Guzmán & Watling, which exhibits an "intense bluing at the base of the stipe"; *P. australiana* Guzmán & Watling, which "when handled

exhibited much bluing at the base of the stipe"; and *P. tasmaniana* Guzmán & Watling, which "exhibited a blue-green tone at the base of the stipe." All three of these species are similar to *P. subaeruginosa*; however, *P. australiana* and *P. eucalypta* are very similar to each other, while *P. tasmaniana* resembles *P. coprophila*. In 1990, Shepherd and Totterdell reaffirmed the presence of *G. purpurata* (Cooke & Masse) Singer in Australia (see Appendix), a potent species containing high levels of psilocin (Gartz 1989).

Guzmán and Watling noted that Picker and Rickards (1970) had chemically analyzed the psychoactive agents in *P. subaeruginosa*, but mentioned that no voucher specimens were available in 1978 for their confirmation. Furthermore, they believed that the work of Picker and Rickards might possibly refer to one of the three newly detected species (mentioned above) that they had just recently described and that specimens of *P. collybioides* analyzed by Rickards were identified as psilocybin positive (Southcott 1974).

Chemical investigations of some of these agarics were then carried out by Margot and Watling (1981) who found psilocybin in *P. cubensis* and in *P. eucalypta* — the latter

also containing several unknown indole compounds — but failed to isolate any psilocybin or psilocin from collected specimens of *P. australiana* and *P. subaeruginosa*.

In the first national government report on drug abuse in Australia (Australian Royal Commission 1980), "... Inspector T.W. Cashion of the Tasmania Police Force said hallucinogenic fungi were prevalent in Tasmania, and that psilocybin and psilocin had been detected in nine species. Each year abuse of these toadstools grew more frequent. He emphasized that their occurrence was state-wide."

Undaunted by any taxonomic confusion and alarmed by the increasing use of naturally abundant psilocybian fungi in the 1970s, a group of Australian chemists then sought to develop a more accurate and efficient method to determine the exact amounts of hallucinogenic compounds in confiscated fungal specimens. Using extractions from dried specimens of *P. subaeruginosa*, these chemists (Perkal et al. 1980) eventually produced an "HPLC [high-performance liquid chromatography] procedure based on ion-exchange chromatography that provides excellent quantitation for psilocin and psilocybin following a simple extraction involving homogenization of the dried mushroom in methanol."

PSILOCYBIAN FUNGI AND THE LAW

Between 1969 and 1975, the nontraditional use of psychoactive fungi appears to have increased rapidly in Australia (Hall 1973; McCarthy 1971). The growing popularity of these mushrooms probably occurred because of several reasons, including personal communications among friends, increased attention in the popular press, and articles published in scientific journals.

The written accounts referred to both accidental and deliberate consumption of several species of mushrooms containing either psilocybin or psilocin. These articles and news items provided both the public and law enforcement agencies with information regarding the existence, use, and effects of these mushrooms throughout South Australia, New South Wales, Queensland, Victoria, Northern Territory, Tasmania, and the Australian Capital Territory. However, the use of these psychoactive fungi became popular in New Zealand during the late 1970s and a recent government report (Unsigned 1987) mentioned that "LSD and hallucinogenic mushrooms were [now] being abused by eating in New Zealand, mainly by 15- to 19-year-olds."

It should be noted that the growth of this illicit activity in Australia preceded the publication of several widely read popular and scientific essays that described the recreational use of these hallucinogenic mushrooms in the United States during the middle and late 1970s (Pollock

1977-1978, 1975).

McCarthy (1971) reported that between 1969-1971 the increasing use of psychoactive mushrooms in various areas of Australia during the late 1960s and early 1970s attracted the attention of the Central Crime Intelligence Bureau of the Commonwealth Police Force, whose principal research officer showed concern about the increasing abuse of these fungi in his country. Hall (1973) stated that because of the availability of "free" hallucinogenic fungi "few if any LSD sales were taking place in Hobart in 1972."

While each Australian state has enacted legislation controlling these psychoactive substances and their analogues, only Queensland had declared (on May 8, 1971) a specific fungus, *P. cubensis* (Earle) Singer, as being a "prohibited plant" under the Queensland Health Act of 1937-1971 (Pollock 1977-1978; Hall 1973). Southcott (1974) reported mushroom intoxications involving this species as early as 1958. Hall noted that psilocybin and psilocin were also listed in the 3rd Schedule of the Tasmanian Dangerous Drugs Order of 1965, and pointed out that both of these chemicals were later designated as Schedule 1 drugs by the International Convention on Psychotropic Substances of 1971.

According to Hall, 60 people in Australia were charged with offenses involving possession or sale of psilocybian mushrooms during 1972; however, he also noted that charges against several of these individuals were later withdrawn when no known psychoactive compounds were found in the confiscated specimens of the suspected hallucinogenic fungi. One year later, in a personal communication to Southcott (1974), Hall stated that "approximately 74" persons were charged with offenses involving illicit hallucinogenic mushrooms in Australia during 1972. This statement varied somewhat from Hall's previous claim that 60 individuals were charged with drug offenses related to the psychoactive fungi in that year. In any case, by 1973, Hall reported that only 27 persons were charged with crimes related to psilocybian agarics.

PSYCHOACTIVE EFFECTS OF PSILOCYBIAN FUNGI

Symptoms produced by eating fresh psychoactive mushrooms begin to occur within 15 to 30 minutes after ingestion (or from five to 10 minutes when prepared in the form of tea or soup). Symptoms persist for up to four to six hours after ingestion. Hollister and colleagues (1960) reported the following clinical effects for psilocybin intoxication in humans:

0-30 minutes — Slight nausea, giddiness (light-headed), abdominal discomfort, weakness, muscle aches and twitches, shivering, anxiety, restlessness, and a numbness of lips.

30-60 minutes — Visual effects (blurring, brighter colors, sharper

outlines, longer after-images, visual patterns with closed eyes). Increased hearing, yawning, sweating, facial flushing. Decreased concentration and attention, slow thinking, feelings of unreality, depersonalization, dreamy state. Incoordination, tremulous speech.

60-120 minutes — Increased visual effects (colored patterns and shapes, mostly with eyes closed). Wave-motion of viewed surfaces. Impaired distant perception. Euphoria, increased perception, and a slowed passage of time.

120-240 minutes — Waning and nearly complete resolution of above effects. Returning to normal within 4-12 hours. Other effects often include: decreased salivation and appetite; uncontrollable laughter; transient sexual feelings and synesthesias (e.g., "seeing" sounds).

In comparison with the clinical experience described above, the following is an excerpt from one of Wasson's experiences with psilocybin mushrooms (1959a): "The mushrooms take effect differently with different persons. For example, some seem to experience only a divine euphoria, which may translate itself into uncontrollable laughter. In my case I experienced hallucinations. What I was seeing was more clearly seen than anything I had seen before. At last I was seeing with the eye of the soul, not through the coarse lenses of my natural eyes. Moreover, what I was seeing was impregnated with weighty meaning: I was awe-struck."

POSITIVE AND NEGATIVE EFFECTS AMONG USERS

It should be noted that reports concerning the number of people seeking medical attention for psychological problems associated with accidental or deliberate ingestion of psychoactive agarics seems to vary considerably from region to region. For example, recreational consumers of psychoactive fungi in the United States (Stafford 1982; Ott 1978; Ott & Bigwood 1978; Haard & Haard 1975; Pollock 1975), Canada (Unsigned 1982a; Guzmán et al. 1976; Oakenbough 1975; Commission of Inquiry Into the Non-Medical Use of Drugs 1972), Mexico (Wasson 1980; Ott 1975; Unsigned 1970; Finkelstein 1969), and South America (Weil 1980, 1973; Pollock 1977-1978) often report their experiences under the influence of inebriating mushrooms as pleasant, even euphoric, with very few published reports regarding medical attention. On the other hand, a number of such reports from Australia (Southcott 1974; Stocks 1963), Great Britain (Young et al. 1982; Harries & Evans 1981; Mills, Lesinskas & Watkinson 1979), and Florida (Peele 1989; Morton 1982) have indicated negative reactions by individuals who sought medical attention for their dysphoric reactions after ingesting these mushrooms. Statistics from Scotland indicate that over 200 such unpleasant incidents occurred there during 1975, including some intoxications attributed to the ac-

cidental ingestion of *Panaeolus subbalteatus* (Bennell & Watling 1983; Watling 1977).

PSILOCYBIAN MUSHROOM POISONING

Ancient or historic evidence of cerebral mycetisms induced by the accidental ingestion of psychoactive mushrooms has been documented in various parts of the world. Early reports of intoxication attributed to the unintentional consumption of these fungi come from China in the third century (Li 1977; Yu 1959), Japan in the eleventh century (Wasson 1973; Sanford 1972; Kawamura 1918), Great Britain in 1799 (Heim [1963] 1978, 1971; Heim et al. 1967; Sowerby 1803; Brande 1799) and the early 1800s (Glen 1816), the United States in the early 1900s (Douglas 1917; Murrill 1916; Verrill 1914), and in France in the early 1960s (Heim, Hofmann & Tschertter 1966).

It is of interest to note a report from Japan that over 344 accidental ingestions of intoxicating mushrooms were reported in 1929 (Ott 1978; Imai 1932). These incidents were reported by people foraging for wild edible mushrooms (Wasson 1973; Sanford 1972). In addition, a number of unintentional intoxications occurred in Africa during the 1940s when mind-altering mushrooms (possibly *Psilocybe cubensis*) were inadvertently sold as a source of food by children in public markets (Vedcourt & Trump 1969; Charters 1957; Cullinan & Henry 1945).

It should be noted that outside of a few intoxications caused by *P. cubensis* (Wasson 1959b; Cullinan & Henry 1945) and one caused by *P. semilanceata* (Heim 1971) the majority of all intoxications that occurred before the deliberate recreational use of these species was caused by various species of *Panaeolus*, with the exception of Japan where some of the inebriations were the result of ingesting *Gymnopilus* species and some that were attributed to the ingestion of *Stropharia caerulescens* Imai (syn. *Psilocybe venenata* Imai [1929]).

Published reports describing symptoms attributed to *Panaeolus* intoxications were often written in a similar manner. Subjective effects included (Cilento 1940; Krieger 1936, 1911; McIlvaine & Macadam [1902] 1912) "... drowsiness, light-headedness, an inability to walk, a staggering gait, giggling, much hilarity, inappropriate speech, uncontrollable laughter, euphoria and acting as if one were on a bender." On the other hand, occasionally terrifying visual and psychological disturbances have been known to result from accidental or deliberate ingestion of *Psilocybe cubensis* (Stocks 1963; Stein 1958; Charters 1957) or *P. semilanceata* (Harries & Evans 1981), which sometimes result in emergency room treatment.

Stein (1959) briefly mentioned similar observations when *Panaeolus* and *Psilocybe* fungi were used in the treatment of a single patient. Mushroom extracts used by Stein were obtained from dried specimens of *Panaeolus*

venenosus Murr. (syn. *P. subbalteatus*), and *Psilocybe caerulea* Murr. Further investigations by Stein, Gloss and Gabel (1959) revealed that the subjective effects caused by the ingestion of *Panaeolus* spp. were more tranquil and less hallucinogenic than the effects produced by the ingestion of certain *Psilocybe* spp.

The fear of poisoning by physically toxic fungi is the main cause of mycophobia throughout the world. Many of the deadly poisonous species of mushrooms macroscopically resemble some of the psychoactive fungi in the genus *Psilocybe* (Beug & Bigwood 1982; Allen 1978a; Ott 1976). For example, three species of *Galerina* Earle in addition to *Conocybe filaris* (Fries) Kühner, which are extremely poisonous mushrooms, are commonly found in mulched gardens in the Pacific Northwest of the United States, and have been observed sharing the same habitat as *Psilocybe baeocystis* Singer & Smith, *P. cyanescens* Wakefield, and *P. stuntzii* Guzmán & Ott (Stafford 1982; Allen 1978a; Stamets 1978; Guzmán et al. 1976; Ott 1976).

Another example of misidentification involves *Chlorophyllum molybdites* Masse (see Figure 6), which is also known as Green Gills or Morgans *Lepiota*. According to Peele (1989), Curator of the Florida Mycology Research Center, it is often picked and mistaken for *P. cubensis*. *C. molybdites* is considered toxic, but not deadly. This species is common in Australia and may occasionally be mistaken for *P. cubensis* (Southcott 1974). Peele also claimed that over 90% of all mushroom poisonings in Tampa, Florida, were the result of ingesting *C. molybdites* (see Ott 1978), which had been mistaken for *P. cubensis*. According to Weeks (1979), "one novice hunter [a woman] here in Gainesville [Florida] spent a stay in the hospital after eating *Amanita verna* (Fries) Quelét (identified from stomach contents). [It] seems that no one ever told her that *P. cubensis* had purple brown spores rather than white." While two children in California (and two adults and three children in Washington) developed a "mydriasis-fever-convulsions" syndrome after ingesting mushrooms (identified as *P. baeocystis*) taken from a lawn habitat, another in the state of Washington was reported to have died due to complications following the suspected consumption of psychoactive mushrooms (McCawley, Brummett & Dana 1962). As mentioned earlier, three children were reportedly poisoned by *Panaeolina foeniculii* (see Allen & Merlin 1990a); however, Guzmán (1988) said that this species is not psychoactive.

A 16-year-old girl from Whidbey Island, Washington, did die in December 1981 after accidentally picking and eating several fresh specimens of a *Galerina* species. She and her two teenage male companions assumed that they had ingested *Psilocybe* mushrooms. Unfortunately, the youths did not report their misguided consumption of the deadly fungus to the proper medical authorities for two

days due to their fear of prosecution (Allen 1988b; Beug & Bigwood 1982; Unsigned 1981).

It is possible that young children may be susceptible to convulsions following the consumption of some varieties of psilocybian mushrooms. However, the curandero Maria Sabina and her sister Maria Ana — made famous by the writings of Gordon and Valentina Wasson as well as others — both first ate these psychoactive mushrooms somewhere between the ages of seven to nine (Estrada 1986), and Maria Sabina continued to do so for over 70 years without apparent physical illness. Also, the Wassons allowed their daughter Masha to eat mushrooms when she was 13 years old, apparently without ill effect (Wasson 1980). In his book *The Wondrous Mushroom*, Wasson mistakenly wrote that Masha was 13 years old in 1955. However, according to Masha (Britten 1990), she was actually 17 years old at the time.

Even a professional mycologist must be quite careful when deciding which wild mushrooms may be safe for human consumption. For example, certain species of mushrooms that are common and edible in Europe can be deadly poisonous or harmful enough to cause physical damage when collected and consumed in the United States, Canada or even Australia (Young et al. 1982; Mills, Lesinskas & Watkinson 1979; Smith 1978; Singer 1975; Southcott 1974; Guba 1970; Cleland 1934). Ott (1978), as well as Badham (1984), reported that the "LD₅₀ in mice for psilocybin has been determined to be 280 mg/kg, oral ingestion," thereby assuming that a person of average weight (i.e., 70 kg/155 lb.) "would have to ingest 19.6 g of [the extracted chemical] psilocybin to produce death." Questioning the validity of this extrapolation, Jansen (1989) stated that "the LD₅₀ has been determined as 280 mg/kg in mice. However, it is not valid to calculate the LD₅₀ for humans by a simple percentage of weight calculation. Mice and humans have very different metabolic rates and dispose of drugs in different ways. It is unlikely that even a large number of psilocybin mushrooms would be toxic in humans, but we cannot suggest an exact figure from data based on rodent studies."

TREATMENT FOR PSILOCYBIAN MUSHROOM POISONING

The major dangers associated with psilocybin are primarily psychological in nature. Anxiety or panic states (bad trips), depressive or paranoid reactions, mood changes, disorientation, and an inability to distinguish between reality and fantasy may occur (Grinspoon & Bakalar 1981; Weil 1980; Mills, Lesinskas & Watkinson 1979; Leary, Litwin & Metzner 1963).

Recommended treatment for this type of Group VI poisoning (Ford 1923) is primarily supportive. Ammirati, Traquair and Horgen (1989) stated that "no specific treat-

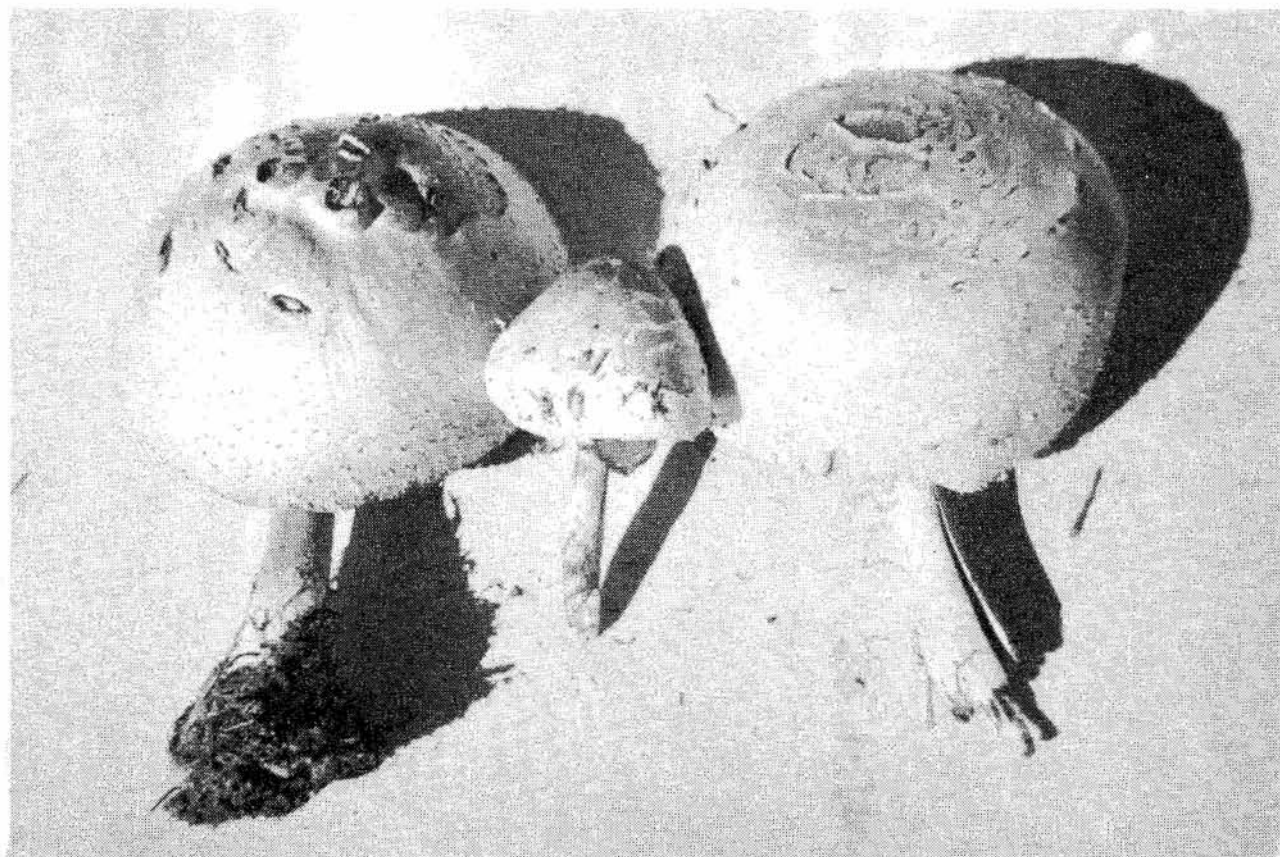


Figure 6. *Chlorophyllum molybdites* Masse: Green Gills. (Photo by John Allen).

ment can be recommended for psilocybin poisoning in humans." Both Rumack and Salzman (1978) and Lincoff and Mitchell (1977) stressed "the importance of measures to reduce absorption of the toxins involved." This involves either gastric lavage or emesis (Francis & Murray 1983). Treatment protocols for poisoning by psilocybian mushrooms include the following:

1. Emesis is induced by 15-30 cc of ipecac syrup, which is followed by large amounts of oral liquids (500 cc).
2. Supportive treatment (i.e., the talk-down technique) is the preferred method for handling bad trips. It involves nonmoralizing, comforting, personal support from an empathetic individual. This is further aided by limiting external stimulation, such as intense light or loud sounds, and letting the person lie down and perhaps listen to soft music.
3. Tranquilizers need only be used in extreme situations and are generally not considered to be necessary. Diazepam (0.1 mg/kg in children; up to 10 mg in adults) may be used to control seizures. Antipsychotics are no longer the favored treatment for bad trips (Strassman 1984). Specifically, medicines with anticholinergic side effects, such

as chlorpromazine, should not be given because these mushrooms can have marked anticholinergic effects of their own (Jansen 1988).

Jansen also noted that medical cases fall into several groups:

1. Those who have taken the drug with little knowledge of hallucinogens and in the absence of responsible persons who can take care of them. These are more likely to be adolescents. They may self-present, but are more often brought for medical attention by their parents.
2. Those who fall as a result of impaired balance or muscle weakness and are knocked out or otherwise injured as a result.
3. Those who are having a bad trip, which may involve acute anxiety and panic, depression, paranoid reactions, disorientation, and an inability to distinguish between reality and fantasy.
4. Cases of idiosyncratic physical reactions, such as cyanosis.
5. Those with recurring phenomena after the mushroom effects should have passed, including prolonged psychosis.

When it is clear that the signs are suggestive of psilocybian intoxication, it is best not to empty the stomach ar-

tificially either by emesis with ipecac or by lavage. Peden, Pringle and Crooks (1982) found that emptying the stomach had no effect on the duration or intensity of the experience once psychological manifestations had properly commenced. Jansen maintained that unless there is a reason to suspect that a more toxic fungus has been ingested or if the patient is a young child, induced emesis is neither necessary nor helpful, and may worsen the situation if the patient is already aggressive and agitated.

Francis and Murray (1983) and Peden and Pringle (1982) also speculated that lavage is not merited if psilocybian mushrooms have been positively identified as the source of discomfort. Furthermore, Peden and Pringle suggested that "gastric intubation can be difficult in these young patients who are often already distressed and not infrequently aggressive. Furthermore the mushrooms may block the standard lavage tubes [used] for drug overdoses."

Medical literature from Australia has reported many incidents concerning the accidental ingestion of these psychotropic fungi. In some of these cases, the psychoactive mushrooms had been mistakenly picked as a source of food to be prepared and served at the dinner table. Others involved the deliberate ingestion of these same psychoactive mushrooms by certain members of the youth and drug subcultures.

The following case studies and media news items, along with commentaries, are presented as a chronological history of psychoactive mushroom ingestion in Australia. Although more than two dozen individual cases of psilocybian mushroom poisoning in Australia that occurred between 1934 and 1975 are reported in the present article, there have undoubtedly been thousands of deliberate ingestions that never required any medical attention or hospitalization. Nevertheless, most of the more than two dozen individual case reports presented below did produce negative psychological reactions. These individuals presented for treatment because of a dysphoric reaction resulting from the ingestion of psychoactive mushrooms. Many required emergency medical treatment in order to arrest and/or ameliorate their unpleasant affliction.

The inherent danger from the ingestion of wild mushrooms lies not so much in the consumption of a psychoactive variety, but rather in the picking and eating of a toxic species that might resemble a hallucinogenic variety. Guzmán and colleagues (1976) wrote that "field and laboratory studies strongly indicate that psychoactive mushroom use as it normally occurs does not constitute a drug abuse problem or a public health hazard." In addition, a survey conducted among college students in California (Thompson et al. 1985) suggested that "the low frequency and few negative effects of [psychoactive mushroom] use indicate that abuse does not present a social problem, nor is there evidence for predicting the development of a problem."

CASE REPORTS

Case 1

The earliest published report of an intoxication from a suspected psilocybian mushroom in Australia occurred sometime prior to 1934. Cleland (1934) wrote that "... some kinds of toadstools give rise to a kind of intoxication. A former colleague of mine told me how his parents once ate a dish of mushrooms, and, as the meal progressed, they gradually became more and more hilarious, the most simple remarks giving rise to peals of laughter. The intoxication passed off without any further unpleasant effects."

Cleland also noted that the mushrooms ingested were probably a dung-inhabiting species. The causative mushrooms in question could very well have been *Copelandia cyanescens* or *Psilocybe cubensis*. Both *Panaeolus subbalteatus* and *P. cubensis*, however, are meaty-looking mushrooms, enticing to naive mycophiles who might be out foraging for wild edible mushrooms. Their fleshy appearances are most certainly delectable to the novice mushroom hunter in search of an exotic culinary delight for the dinner table. However, since no hallucinations were reported from this intoxication, it may be assumed that the mushrooms in question were probably a *Panaeolus* species.

Case 2

In 1941, a number of mushroom poisonings, resulting from fungal ingestions of what were believed to be *Panaeolus ovatus*, occurred in the Northern Rivers area of New South Wales, particularly around Murwillumbah (Trotter 1944). One case of special interest was reported in April 1941 (Unsigned 1941): "Specimens of *P. ovatus* were harvested from dung after a period of wet weather. Soon after dinner, the effects became evident. First drowsiness, then dizziness. After a while several patients became uncontrollably hilarious and acted as if they were drunk as in alcohol intoxication. They displayed a difficulty in standing and walking, and were incoherent and made many foolish remarks, laughing inordinately. Some of the patients vomited and hospital treatment was necessary." This case was similar to one originally reported by Krieger (1936, 1911) in the late 1930s. The mushrooms involved in this inebriation were probably *Copelandia cyanescens* that macroscopically resemble *Panaeolus antillarum* (syn. *P. ovatus*).

Case 3

On March 14, 1942, three persons became intoxicated near Eudlo, Queensland, and sought medical treatment from Dr. H.K. Shaw of Buderim Mountains (Trotter 1944). The species of mushrooms ingested in this case are unknown.

Case 4

The 1943 records of the Department of Repatriation and Compensation in South Australia provided another case of accidental mushroom poisoning (Southcott 1974):

A 21-year-old soldier was admitted into the Australian Casualty Clearing Station near Brisbane, with the following symptoms. "19 May 1943. The soldier reported that he ate some fried mushrooms at about 1:00 p.m. . . . He described the fungi which he had picked as being brown, with flat tops. The mushrooms were dark underneath and had appeared to have been drying in the sun for a day or two. One hour later the effects had begun. At first he experienced a light feeling in his legs, then felt lightheaded and giddy, losing control of much of his emotions. He reported that he could not stop laughing and felt as though he was on a bender. One other person also ate some of the same mushrooms and exhibited the same symptoms. The latter was given an emetic and recovered quickly, and was released. The soldier recovered and was discharged the following day."

This poisoning was probably the result of ingesting *Panaeolus subbalteatus*. This assumption is based on the fact that the victim claimed that the pileus was brown and that the cap was flat (Ammirati, Traquair & Horgen 1989; Watling 1977), and the symptoms described by the victim are similar to those previously attributed to *Panaeolus* intoxications. The discharge diagnosis was "fungus poisoning." Southcott noted that the fungi (believed to be *P. ovatus*) were obtained in the Delaney's Creek-Woodford area of southern Queensland, which is located 12 miles from Carbooler.

Case 5

Similar intoxications occurred on November 24, 1943, when a number of poisonings (three females and one male) were reported after these victims of cerebral mycetism were admitted into a district hospital (Trotter 1944). Shortly after they had eaten a meal of cooked mushrooms, which they had picked in a heavily manured cow field in Eudlo, they apparently became aware that something was definitely changing their perception of reality: "... within twenty minutes from the moment of ingestion of these mushrooms, each patient began to feel a numbness in their arms and legs. They reported seeing colored lights and laughed quite hysterically. The male patient felt as if he had been on a bender. Zinc sulfate was administered which immediately induced vomiting. He was released from the hospital on the following day with no ill effects. . . ."

The mushrooms that these four patients had consumed were forwarded to the University of Queensland. There they were identified as belonging to the "family of horse mushrooms" known as *Psalliota arvensis* (*Agaricus arvensis*). The mushrooms involved in this particular case, however, were most likely either *Psilocybe cubensis* or *P. subaeruginosa*. Macroscopically, *P. cubensis* could be mistaken for an *Agaricus* species because of its large size and color.

Case 6

On December 18, 1943, five more cases of psychoactive mushroom intoxications were reported from Murwillumbah. According to Trotter (1944), the symptoms in these cases were described as being similar to alcohol intoxication. An emetic was given to all five patients and recovery was rapid. The patients were allowed to leave the hospital eight hours after being admitted. The mushrooms in this case were later identified by Dr. D.A. Herbert of the University of Queensland as *Panaeolus ovatus*. Trotter only found two previous reports of similar intoxications in the Australian literature. He briefly noted that Cilento (1940) and a journalist reporting in an article appearing in the *Agricultural Gazette of New South Wales* (Unsigned 1941) both referred to similar cases of inebriation that occurred prior to 1941. Symptoms in these mushroom intoxications (which appeared soon after a meal) were also reported as being similar to alcohol intoxication. Again, the mushrooms in both of these instances were identified as *P. ovatus*, and were also picked in an area near Murwillumbah. It may be assumed that the mushrooms in question were probably *Copelandia cyanescens*. This is quite likely, inasmuch as both species often grow side by side and may be confused.

After 1945, no cases involving the accidental ingestion of inebriating mushrooms were reported in the Australian medical journals or the press until 1957. In that year, the Wassons had announced their discovery of the ceremonial use of hallucinogenic mushrooms in Mexico.

Case 7

Willis (1957) published an interesting anecdote regarding the suspected ingestion of *Panaeolus ovatus*: "Rumour has it that they will cause an intoxication under which the victim suffers a strange sensation of growing taller and over-topping the objects about him: Who knows but this may (very well) be the magic mushroom of 'Alice in Wonderland' fame." Willis then went on to say that "*P. ovatus* has intoxicated people near Sydney."

Case 8

From 1957 to 1963, according to the physician Stocks (1963), 11 patients were admitted to the Princess Alexandra Hospital in Brisbane due to complications of poisoning from several different species of toxic and/or mind-altering fungi. Five of these cases were definitely caused by psilocybian mushrooms; two other patients, whose onset of disturbing symptoms began 10 minutes after consumption of the mushrooms, were also probably affected by psilocybian intoxication. Stocks referred to these mushroom intoxications as accidental ingestions, and he inadvertently reported that Wasson's first personal experience with these mushrooms had produced undesirable effects. Although Wasson's first experience (Wasson 1957) had been reported as being profound and ecstatic,

it is possible that Stocks was actually referring to Hofmann's personal account (1980) regarding his somewhat unpleasant initial experience while under the influence of *Psilocybe mexicana* Heim, or to Stein's frightening experience (1958) while under the influence of five dried grams of in vitro grown specimens of *P. cubensis*.

Although Stocks suggested that the hallucinogenic effects of these mushrooms were more potent than either lysergic acid diethylamide (LSD) or mescaline (peyote), it should be pointed out that users of these three hallucinogens usually prefer the natural experience of the mushrooms because they have a duration of three to six hours as opposed to the eight- to 12-hour experience of LSD, mescaline or MDA (Pollock 1976; Weil 1975-1976, 1973).

Stocks' article on mushroom poisoning presented two cases of psilocybian intoxication. The first referred to a woman who "... noted after 30 minutes of ingestion, a dark cloud passing across her eyes, then a green cloud. Her tongue felt thick and she complained of being paralyzed. There was no impairment of memory, and no hallucinations other than the colored vision; the symptoms resolved in 12 hours. This patient described her experience as distinctly unpleasant."

In the second case, Stocks described a man who sought medical treatment at another southeast Queensland hospital:

After five minutes of ingestion, the patient reported that he felt a tingling in both of his temples, and a general feeling of strangeness. His TV set "changed color" and the images on the screen became brighter and steel-blue. Vision later became blurred, and objects seemed either too large or too small, and appeared alternately to advance and recede from him. Later, sharp images of dragons appeared in a brilliantly colored oriental setting. He had to fight to stay awake, experienced a dry mouth and a tongue "like leather," and regards the whole experience as definitely unpleasant.

Case 9

Cribb and Cribb (1975: 209), when describing the peculiar incident in Case 8, claimed that the "... victim decided it was time to seek medical aid when he started receiving a colored picture from his black-and-white television set." Originally, Stocks (1963) did not indicate whether the television set produced a black-and-white or a color image; however, according to a recent communication, Stocks (1988) pointed out that colored TV sets were quite uncommon in Australia in 1963.

Case 10

Aberdeen and Jones (1958) were the first investigators in Australia to publish an article in which they recognized the psychoactive properties of *Psilocybe cubensis*. As mentioned earlier, this was accomplished because they were commissioned to study the suspected chemical properties of *Panaeolus ovatus*. They had assumed that a num-

ber of mushroom intoxications that had been attributed to *P. ovatus* were probably due to the consumption of *P. cubensis*, and they cited several reasons that led them to that conclusion.

Case 11

McCarthy (1971) wrote that "over the years, the Southport Hospital on the Gold Coast has had a steady flow of accidental poisonings with *Psilocybe cubensis*. A good example occurred in 1969 when a whole family was affected after a picnic somewhere in the mountains." No mention was made as to the exact location where this incident took place. Symptoms from this intoxication included "... euphoria, depression, inappropriate speech and answers, visual hallucinations, ataxia, vomiting, urinary incontinence, diarrhea, dry mouth, and dilated pupils, and a respectable family man was caused to run naked through the hospital, trying to molest the nurses who were attempting to treat his illness."

McCarthy briefly mentioned that heavy rains in the spring of 1969 produced bumper crops of *P. cubensis*, and that large quantities of this species were consumed by hundreds of people who ate them raw, with toast or in soup. These youthful users, who were members of Australia's counterculture, described their effects from the ingestion of these mushrooms as being similar to LSD, but more natural. According to McCarthy, the popularity of psychoactive mushrooms at this time (i.e., winter 1969) diminished due to many regular users who began to experience extreme depression and lethargy. He also indicated that some users even reported that they had "lost their will to live." This resulted in a number of so-called freak-outs, and by the end of 1969 local authorities assumed that the popular use of mushrooms had declined.

McCarthy also mentioned that it was not too long before an export market was established by dealers and users, who by March 1971 had made *P. cubensis* available to users in Sydney and other larger cities throughout Australia. To illustrate the availability and danger of toxic plant substances, Morton (1982) reported this same kind of exportation in a book describing several poisonous plants common in Florida. By 1972, Tasmanian authorities became concerned that the widespread collection and ingestion of psychoactive fungi in their state would attract interested people from the mainland of Australia to Tasmania. For example, Hall (1973) noted that the "exportation of fungi from Tasmania to the mainland is highly likely, as knowledge of suitable species becomes [more] widespread."

Case 12

At 7:00 p.m. on June 3, 1969, the Australian Broadcasting Commission aired the following story of an intoxication that occurred near Forster along the Central

Coast of New South Wales (Unsigned 1969a):

The New South Wales Department of Agriculture is investigating the case of a Sydney couple who had violent hallucinations after eating mushrooms which they had picked during a weekend sojourn. The couple, both professional artists, were kept under observation at the Forster Hospital, while the effects from the mushrooms wore off. For over three hours, they experienced symptoms similar to an LSD intoxication. The couple told attending physicians that they had each eaten half a dozen bush mushrooms, and within five minutes or more were experiencing hallucinations. The woman reported that she felt as if her skin was peeling off of her hands, and she believed that she was dying. They were both terrified from their inebriation. Samples of the mushrooms were sent to the Department of Agriculture to be analyzed for identification.

On June 5, 1969, a follow-up radio broadcast from Sydney declared that the mushrooms in question had not been identified. However, because the symptoms in this incident were described as resembling an LSD intoxication. The mushrooms involved were probably *Psilocybe cubensis* or *P. subaeruginosa*. In this case as well as many others involving the use of suspected psychoactive fungi, reference is rarely made as to whether or not the specimens of mushroom material received by the toxicologists or mycologists is fresh, dried or derived from a gastric lavage.

Case 13

On Friday, July 11, 1969, four young men from New South Wales, 20 to 22 years of age were each fined \$200 on charges of being in possession of the drug psilocybin (Unsigned 1969b):

A complaint was registered by the manager of "Sippy Downs" station [ranch] near Nambour, which is about sixty miles north of Brisbane, stating that the young adults had gained illegal entry onto the owner's private property. Detective-constable T. Tame and another police officer went out to the property. There they found a parked grey van alongside the road. A box containing the mushrooms was observed by the officers on the floor of the van, so the police asked the four adults to accompany them to the Nambour Police Station, which the four men consented to do.

The magistrate of the court found the young men guilty and allowed them two weeks to pay their fines. If the fines were not paid on time, then they would be found in default and would have to serve a sentence of one month imprisonment.

Cattle ranchers in Australia have often been described as irate that some mushroom pickers have little respect for their property, trespassing frequently in search of psychoactive fungi. In the United States, mushroom pickers have been known to litter the fields and paddocks with garbage (e.g., bottles and beer cans), bring dogs into the pastures that chase cattle, and break down fences or leave gates open so that cattle wander out onto the roadways (Unsigned 1977; Wilson 1976).

Case 14

In the summer of 1969, after reading the two above-mentioned cases and the two subsequent articles that had appeared in the Australian popular press (Unsigned 1969c, 1969d), Picker and Rickards (1970) were prompted to examine specimens of *Psilocybe subaeruginosa* for the presence of hallucinogenic indole compounds. They found that this species contained psilocybin, but no psilocin was detected. Specimens in this study were collected in the Australian Capital Territory during the autumn of 1969 by Shepherd of the Division of Plant Industry, Commonwealth Scientific Industrial Research Organization.

Case 15

Southcott (1974) described an incident in which a young woman (17 years old) from Adelaide, who had a history of marijuana use and on one occasion had used LSD, sought medical treatment after having a bad trip while under the influence of *Copelandia cyanescens*, which had been obtained in the vicinity of Adelaide. She became frightened and sought immediate medical attention because she thought that she was a banana and that somebody was attempting to skin her. This incident occurred sometime in 1971.

Case 16

On February 2 and 3, 1971, narcotics officers from the Darwin Drug Squad brought some fungi specimens (fresh and dried samples) into the Darwin Animal Industry and Agricultural Branch for identification. The mushroom specimens had been seized from some hippies who knew of their psychedelic properties, and were not only collecting and using them but were also selling them.

Susan Aldrick forwarded some of the mushrooms to John Walker of the New South Wales Department of Agriculture at Rydalmere for identification on February 3, 1971. Eventually the mushrooms were identified as being *Copelandia cyanescens* (Berk. & Br.) Singer. Southcott (1974) mentioned that this was probably the first report of an intoxication in Australia of *C. cyanescens*. A possible reference to this species was first reported from Australia in 1892. In Cooke's *Handbook of Australian Fungi* (1892: 67) there is a listing for *Agaricus papilionaceus* (Bull.) Fr. that according to Bresadola is *C. cyanescens*.

Case 17

In July 1971 two adults and their child sought medical treatment after the deliberate ingestion of some specimens of *Psilocybe subaeruginosa* (Southcott 1974). The child was taken to the Adelaide Children's Hospital. The parents had supposedly sought treatment at the Royal Adelaide Hospital, yet no records exist from the hospital showing

that the parents of the child received treatment there. These two adults described their mushroom-induced symptoms as feeling like they were slipping out of their skins. Southcott also reported similar symptoms from several victims of these psilocybian intoxications.

Case 18

On July 11, 1971, a three-year-old girl ate some mushrooms "which did not look like mushrooms" (Southcott 1974). About one hour later, she began to scream that she was seeing things, and she kept asking for a glass of water. The mother noticed that their little girl's pupils were widely dilated. The adults, who had also eaten some of the same mushrooms, felt peculiar and complained of having a bellyache with some nausea.

The child was seen at the Adelaide Children's Hospital, and 90 minutes after the ingestion of the mushrooms she was conscious and alert. Even though the child appeared to look well, her eyes were puffy and some yellow discharge was evident. Her pulse rate was recorded at 136. Ipecac was administered as a syrup, which was followed by vomiting. The vomit was found to contain spaghetti (with mushroom sauce). After a few hours, the parents decided to take the child home.

Case 19

One year later, a lurid account (Hailstone 1972) of cases 17 and 18 appeared in a local newspaper that purportedly referred to these incidents. The following is an excerpt from this news item: "A small brown mushroom that grows widely in the Adelaide Hills in July and August is providing drug addicts and thrill seekers with a potent hallucinogenic drug. The mushrooms, brown all over, contain the drug Psilocybine, which is prohibited by the Narcotics and Psychotropic Drugs Act [of South Australia]. The mushroom is being passed around in fresh and dried forms. Three young people who tried the mushroom drug last year were admitted into the Royal Adelaide Hospital and treated for poisoning."

An unnamed expert at the Waite Agricultural Research Institute warned that even small quantities of it (i.e., psilocybin mushrooms) could cause serious poisoning. However, Hailstone cited Lloyd Davis, Pharmacological Inspector for the South Australia Health Department, who stated that "users and those interested knew what the mushrooms looked like, where they could be found, and how to use them." Davis also "doubted whether amateurs experimenting with them would be poisoned because there was a well-organized system of communication among users and would-be users."

One can easily see how the true facts of these two above-mentioned cases could become distorted in this account taken from a local newspaper. Such journalistic license by newspapers that present sensationalistic reporting

of drug cases can be misleading and sometimes dangerous (Allen 1988b).

The fungus in cases 17 and 18 was identified as *Psilocybe subaeruginosa*, yet a photograph accompanying the above-mentioned news item portrayed several fungal specimens that macroscopically resembled either small specimens of *Copelandia cyanescens* or *P. semilanceata*.

Case 20

This case concerns a young girl in Campbelltown, a suburb of Adelaide. Clinical records from the Adelaide Children's Hospital describe a three-year-old girl with an ongoing allergic condition. Her symptoms may have resulted from the ingestion of *Panaeolina foeniculii*, a suspected species that was known to grow in the lawn of her house. Southcott (1974) reported on this case as follows: "... for some months she had been known to have repeated episodes of hallucinations. ... Symptoms reported ... included: seeing colored lights on the ceiling, seeing cats that were not there, and feeling that she was bigger than she really was. An attack usually lasted no more than four hours." For a more detailed report on this case, see Allen and Merlin (1990a).

Case 21

In a personal communication to Southcott (1974), Hall provided the following account of a local user's experience with psilocybian mushrooms:

I interviewed one abuser in Hobart, Tasmania, during 1973, who claimed that he had taken about 100 "Gold Tops" with bread and butter at one sitting. His "trip" was similar to those he had obtained with LSD, although he felt an overwhelming sense of panic some hours after ingestion of the fungi and he therefore ran several miles home, sensing that he was being pursued, although at the time he was fully aware that there was really no one following him. This abuser felt that he was adversely affected for three months after taking the fungi. He believed that his driving was impaired for the whole of a three-month period, particularly his reaction time, and stated that he would not use the fungi again, although he thought that he might further experiment with LSD.

Because of the large amount of fungi ingested in this case, one can assume that the species involved was probably *Copelandia cyanescens*.

Hall then went on to explain that "the adverse side effects of these fungi have become apparent to some within the drug subculture and it would appear that detected use of this type of plant form is declining." In fact, the recreational ingestion of these mushrooms appears to be increasing (see case reports 26 through 30).

Case 22

In 1973, prior to the above statement by Hall, he reported on the use of psychoactive mushrooms in Australia.

It should be noted that this article, which appeared in the United Nations publication *Bulletin on Narcotics*, was presented as a critique that proposed new legislative measures to restrict and curb the use of mushrooms.

Hall noted that, in 1972, the Tasmania Police Drug Squad had confiscated some fungal specimens, which were previously unknown in Tasmania. On examination, the mushrooms were identified as being *Psilocybe collybioides*, reportedly a new species in Australia that previously had been recognized as only occurring in Argentina. Specimens analyzed for indole compounds revealed the presence of psilocybin. According to Guzmán (1983) this mushroom does not exist in Australia. He suggested that the fungus in question (*P. collybioides*) may very well have been one of the three newly detected hallucinogenic species of *Psilocybe* that Guzmán and Watling (1978) had just recently recorded as indigenous only to Australia.

According to Hall (1973), reports from the Tasmania Police Department indicated that "local drug abusers were picking the mushrooms (*P. collybioides*), and after drying them and crushing them, would then place the powdered fungus into gelatin capsules for resale on the illicit drug market where they would sell for as much as six dollars a capsule." Pollock (1975) also noted that mushroom capsules were being openly sold on the illicit market in Australia.

At the time the 1973 article was being written, Hall believed that because of the increasing popularity of these mushrooms, a decrease in the sales of LSD had occurred in Australia, and that "few if any sales of LSD were taking place in Hobart in 1972." At the same time, however, Hall claimed that "as a result of the widespread use and abuse of these fungi, law enforcement authorities were considering new legislation in order to curb the future abuse and end the problem of mushroom use." At this time, Hall was the Principal Research Officer of the Narcotics Section of the Commonwealth Police Force in Canberra and had reported that several drug users had been experiencing recurring flashbacks from mushrooms that were similar to those associated with LSD consumption.

The present authors are not aware of any firm evidence that mushroom flashbacks can occur. Francis and Murray (1983) reported that "out of 318 specific cases of *Psilocybe* intoxications occurring in England between 1978-1981, 21 patients experienced 'flashback phenomena of some form' for up to four months after ingestion." They also mentioned that some of these were the result of drug synergy and polydrug abuse, and that "with such a controversial phenomena as 'flashbacks,' it is necessary to specify precisely what form these do take, so that they may be distinguished from psychological stress reactions wrongly attributed to past drug use." For more information on flashbacks see Strassman (1984) and Alarcon,

Dickinson and Dohn (1982).

Hall also pointed out that "if solutions of mushroom extracts were injected intravenously, the results could be very serious." There are no known cases of such injections, and it seems extremely unlikely that anyone would attempt to do this.

In Tasmania, government officials and local law enforcement authorities became concerned about the influx of drug users and dealers who might travel from the mainland to Hobart, bringing with them species of psychoactive fungi. They were also concerned that the Tasmanian varieties of psychoactive species would probably be in great demand and therefore might be exported throughout Australia from Tasmania, especially as the use of these mushrooms had become well known to drug users throughout the continent. Hall and several other interested individuals thus began to view the recreational use of psychoactive fungi as a nationwide problem.

In the conclusion to Hall's article on problems in legislating against the abuse of psychoactive fungi, he suggested that the following be implemented: "It would appear that the Australian authorities could make a valuable contribution to law enforcement in the drug area by sponsoring research projects designed to elucidate the pathway involved in the natural synthesis of these compounds [psilocybin and psilocin] and their metabolism and dehydration, the presence of their concentrations under a variety of conditions, including natural growth, and the evaluation of the pharmacological actions of potential hallucinogens related chemically to psilocybin and psilocin which can be identified as being present in these fungi."

In Great Britain, Young and colleagues (1982) suggested using fungicides on psychoactive *Psilocybes* in order to curb their potential abuse. However, this idea is impractical because the inherent danger of eating a fungus that has been sprayed with toxic substances could do more damage physiologically than actually ingesting the mushrooms. Another reason for not spraying these mushrooms with fungicides is that many of the hallucinogenic species maintain a symbiotic relationship with the trees and plants growing around them, and fungicides could damage the natural ecological relationship between the fungi and the vascular plant life. This misguided use of fungicides has apparently caused much discomfort to users in New Zealand where this practice is approved by some law enforcement authorities (Jansen 1989).

Case 23

This case concerns a young South Australian university student who considered himself a member of the drug-using subculture (Southcott 1974). Seen in treatment over a period of three years, he decided that his use of drugs had caused him harm. He thus resolved to stop drug use completely.

At the age of 19, he was introduced to *Cannabis*, and only used it in order to become part of the youth protest movement in Australia. This apparently gave the student much confidence and a great feeling of belonging. From a few joints a week, he progressed over a six-month period, and after another 30 months he became a daily user.

His use of *Cannabis* during these 30 months was also interspersed at intervals with the usage of LSD and hallucinogenic mushrooms. As only small amounts of LSD were available, he was only able to take this substance on one occasion.

During the 30-odd months of drug usage, this student stated that he had only eaten mushrooms on four separate occasions. Each of his experiences was different, and involved two species of mushrooms.

In his first episode of mushroom intoxication, he used "Queensland Gold Tops" without any other drug. He claims to have eaten only three semi-dried mushrooms, consisting of both caps and stems, and consumed them with bread and jam to disguise their bitter and somewhat acrid taste. After about 30-45 minutes, he noticed a mild euphoria creep up on him, gradually intensifying as his inebriation grew, while waves or ripples of euphoria occurred over the next three to four hours. He felt that a pleasant song would increase his euphoria. It was assumed that the mushrooms were probably *P. cubensis*.

His second and third experiences involved a species known as *P. subaeruginosa*, and the student, for some reason or other, had a hard time in separating the symptoms of these two episodes. He referred to the mushrooms in these two episodes as "South Australian Gold Tops," which were allegedly picked in National Park, Belair, and from other spots in the Adelaide Hills. On one occasion fresh mushrooms were eaten, and on the other, dried specimens were consumed. One of the two experiences was similar to the first [experience], and the other was different.

This third episode involved the student and several friends, all of whom also ate some mushrooms about an hour prior to going to the cinema. The picture apparently was a depressing one about a family afflicted with mental illness, and the student developed a paranoid-anxiety reaction to what he was watching. He stated that he also had similar experiences while in crowds of people. His friends also claimed to have disturbances during the film. Once the movie was over, the distressing symptoms disappeared.

His fourth episode occurred after he had consumed some Australian "Gold Tops," which were presumed to be *P. subaeruginosa*. This time he ate only two small young mushrooms which were collected in the Adelaide Hills by some friends. Since his dosage was lower than the three previous trips, he experienced only some mild euphoria, which lasted no more than 3-4 hours, and reported no unpleasant effect like he had experienced during his three other trips. He mentioned that he had also smoked some "low grade" *Cannabis* prior to taking the mushrooms.

Three days later, while in a crowd of people, he experienced an acute fear reaction, and sought medical treatment. He stated that he was informed that his symptoms were the results of prolonged repetitive usage of *Cannabis*. For this reason, and possibly others not mentioned, the student felt no reason to associate his paranoia specifically with the use of the fungi, but on the other hand he considers that it cannot be disproved that the fungi may also have contributed to his problem. Because of this, he has resolved never to use any of these substances again, and greatly regrets that he ever started to use them.

Another interesting effect of the symptoms of cerebral mycetism that Southcott noticed about this case was that several of the student's friends had also ingested the exact

same amount of mushrooms during the student's first trip. One of the students reported that his "whole visual field became covered with 'dots as though it was a computer printout' — colored dots, regularly spaced, floating in space, perhaps corresponding somewhat to the painting technique of pointillism."

Case 24

This account is also from an unidentified mushroom user from South Australia, who wished to remain anonymous (Southcott 1974). While this person was more than willing to describe his personal use of these mushrooms, he was extremely cautious about revealing his identity and expressed concern about who might read his story, whether they be friends or law enforcement officers. He admitted that he would deny his story if need be.

This denial of the use of psychoactive fungi by a member of the drug subculture can be compared, in some ways, to the secrecy by which various Indian tribes living in Mexico during the past four centuries have prevented foreigners from exploiting or persecuting their use of psychoactive fungi. In the conquest of Nueva Espana, the Spanish clergy deplored what they considered to be pagan, ritual practices, many of which utilized hallucinogenic plants and mushrooms ceremonially. The Spaniards harassed, often murderously, those who were caught carrying out these practices. Eventually, out of fear of persecution, the Indians of Mesoamerica began to hide their use of these plant substances from their Spanish conquerors, and would only communicate their knowledge and use of these substances to one another in secret. Just as the early Christians once tried to hide their Christianity from their peers in ancient Rome, so did several native Mesoamerican tribal peoples hide their use of these magical plants from the Spanish clergy and the Holy Office of the Inquisition (Wasson 1980; de la Serna 1892; Unsigned 1624; Unsigned 1537).

The following account — provided by Southcott — is a good example of the psychological and physiological symptoms of psilocybian intoxication. It also provides insight into this user's justification for his use of psychoactive fungi.

The mushrooms which were prepared in a broth and boiled for about two minutes may be used to induce an extremely powerful hallucinatory trip. When eaten raw the effects can take up to two hours to come on [This time lapse only occurs when fresh food has been consumed prior to the ingestion of fungi], but taken in soup form (or as tea) it can begin to occur within five to ten minutes after being eaten.

The first noticeable effect is a tingling sensation from head to toe, followed by extreme warmth or cold all through the body. Mild hallucinations begin to occur within a quarter of an hour, and become stronger as the trip reaches its peak. This peak can be a terrifying experience for the novice; he does not know what to expect, and can believe himself to have gone insane. This "insanity" can also be pleasurable in many cases and can cause a

person to lose all unnecessary fear of things which had previously seemed impossible to bear. Everything material and otherwise is laid in front of you for examination and nothing is beyond human comprehension. In my own opinion and experiences these mushrooms used by persons capable of understanding the tremendous power contained in them can only be beneficial in their effect.

I have found them growing in flat-bottomed valleys and on gentle slopes. They thrive in moist, grassy soil and can range in size from a quarter of an inch [approximately 6 mm] up to two or three inches [5.0-7.5 cm] in diameter. [Bob Harris' book (1976) *Growing Wild Mushrooms* contains a photograph of *Psilocybe cubensis* with a cap that is over 10 inches in diameter.] In regard to an overdose of these mushrooms, this user feels that [it] is not really an accurate term for this condition. It is more an extreme fear of certain things or people which causes "freak-outs." I have successfully calmed down several people who thought they were on the point of dying. The trip can change from one of fear and hysteria, to one of pure ecstasy in a matter of a second if a person is treated correctly.

The police, in my opinion, [can] cause more bad experiences than all other reasons combined. This is because people strive to have a good trip but the thought of arrest or even gaol [jail] can be drastic at the height of a trip's peak. I myself have almost lost all fear of everything I previously feared.

I intend to continue the use of these mushrooms and see where it leads me, whether it be a good (lawful) or bad thing, and I am not signing this report on the grounds that it may incriminate myself and other persons.

Case 25

By the middle of the 1970s, *Copelandia cyanescens* appears to have become just as popular as *Psilocybe cubensis* and *P. subaeruginosa* in Australia, and their use in that country had become well documented. According to Cribb and Cribb (1974), *P. cubensis* caused users to experience feelings of great well-being, uncontrolled mirth, and disturbances of vision. Colored photographs of *P. cubensis* in Australia were published in 1976 in a popular agricultural journal (Aberdeen & Voct 1976) but were labeled as being toxic; Margot and Watling (1978) speculated that *P. cubensis* was "even smuggled out of Australia for use abroad." Reports on the popularity of psychoactive fungi use in Australia appeared in other publications (Pollock 1977-1978, 1975).

Case 26

In a special government report on drugs and drug abusers (Australian Royal Commission 1980), several prominent Australian citizens expressed their concern about the growing problem of mushroom abuse in Australia:

A Queensland school teacher told the commission that because LSD was difficult to obtain and was expensive, people were picking hallucinogenic mushrooms. These could easily be collected around Samford, for example. An informed witness agreed that psilocybin-producing fungi were growing in and around Brisbane and mentioned Samford, Ferny Grove, Pinkenba, Dayboro, and Beenleigh. A senior Queensland Police Officer said

that "Gold Top" mushrooms [*Psilocybe cubensis*] were plentiful in the Gold Coast area, but there was no evidence to suggest that they were grown commercially. He said this prohibited plant thrived in the Currumbin and Tallebudgera areas in the wet season and was harvested by drug users.

There is no evidence in the literature indicating that the cultivation of psychoactive fungi (particularly *P. cubensis*) is common among Australian or New Zealand users. One of the present authors (Allen) obtained information from D. Tatelman (1988) of the Homestead Book Company in Seattle verifying that mushroom-growing kits from the United States are sold through the mail to both Australian and New Zealand citizens on a monthly basis. Therefore, it may be that some users in Australia and New Zealand grow these mushrooms at home. The home cultivation of either *Psilocybe*, *Panaeolus* or even *Copelandia* spp. would not readily attract the attention of the public or local law enforcement agencies because their growth could be well hidden in basements, garages, attics or closets and are not as easily detected as a field of *Cannabis*.

In this same governmental report, Captain B.C. Mundy, Commanding Officer of the Salvation Army in Darwin, Australia, presented details concerning the availability of psychoactive mushrooms in the Northern Territory. According to Mundy, "'Gold Tops' and 'Blue Meanie' mushrooms grew freely in the tropical climate in animal manure and in manured gardens. Captain Mundy referred to an incident where a resident of the Red Shield hostel in Darwin, who was accused of housebreaking, said he picked 'Blue Meanies' in the hostel garden and boiled them to make a drink. As a result he was found by the court not responsible for his actions. Captain Mundy explained that the garden had shortly before this incident been treated with fowl manure."

If true, this is probably the first reported case of the species *Copelandia cyanescens* (Blue Meanies), being found fruiting from the manure of either chickens, geese or ducks, rather than from the manure of ruminants (i.e., four-legged mammals).

Case 27

In 1982, a brief note referring to the recreational use of psychoactive mushrooms in Australia appeared in a book on poisonous plants published in Florida (Morton 1982). Morton pointed out similarities in mushroom use between Australia and the United States.

Four years later, a news item appearing in an Australian newspaper (O'Neill 1986) briefly mentioned that "heavy rains had caused a prolific growth of hallucinogenic mushrooms." In addition, the same article stated that the "danger in eating these magic mushrooms lay not so much in the toxicity which they produced, but rather in the ease with which they could be confused with genuinely poisonous species." Annual public announcements regarding the weather-related appearance of psychoactive

fungi by newspapers and popular radio station programs may attract more individuals interested in ingesting these fungi.

Case 28

In 1988, a surfer from New Zealand who was vacationing on the Hawaiian island of Oahu claimed that although most users in New Zealand and Australia were unaware of the botanical names of hallucinogenic species common in his country, he reported to one of the present authors (Allen) that his friends referred to them as "Gold Tops." According to Jansen (1989) this is not correct. The term "Gold Tops" is rarely used by New Zealanders, who are thoroughly resistant to using Australian expressions. The most popular term is "Magic Mushrooms." There are no other popular names in common use. The surfer mentioned *Psilocybe cubensis* to the author, yet *P. cubensis* does not occur in New Zealand (see the next section on psilocybian mushrooms in New Zealand). This same user also said that he had picked and eaten magic mushrooms in Victoria, Australia.

Case 29

An English couple, both in their late thirties, who had previously eaten Liberty Caps (*Psilocybe semilanceata*) in England during their teenage years, reported that after having moved to New Zealand they were delighted to find Liberty Caps down under but also enjoyed eating Blue Meanies (*Copelandia cyaneoscens*), which they fried in butter and then ate on toast with jam. They said that they had ingested these mushrooms on several occasions after moving to New Zealand. This couple denied having knowledge of *P. cubensis* or any other species except for Liberty Caps and Blue Meanies. Both of these adults spoke of eating Blue Meanies when visiting relatives in Australia.

Case 30

In June of 1989 (Unsigned 1989), a 23-year-old man from Kelston, New Zealand, appeared in District Court where he was convicted of possessing psilocybin. A police spokesman said that they had confiscated approximately 120 g of magic mushrooms on entering the suspect's home. The mushrooms were found packaged in plastic bags and others were in various drying stages on newspapers placed on the floor. The young man had told the arresting officers that he enjoyed the mushrooms because they "gave him a better outlook on life."

PSILOCYBIAN MUSHROOMS IN NEW ZEALAND

Until the late 1970s, the fact that psilocybin-containing mushrooms grew in New Zealand was known to very few. The perception of those interested in psychedelic

drugs was that magic mushrooms were an Australian phenomenon, and that the only mushrooms of this nature to be found in New Zealand had arrived via the mail. Indeed, all of the analyses performed by the Department of Scientific and Industrial Research (DSIR) for the police at this time were on *Psilocybe cubensis*, which had been sent to New Zealand in the mail and intercepted by customs. Not until the early 1980s did a more general awareness appear within the psychedelic drug-using subculture that psilocybin-containing mushrooms could be found on both islands of New Zealand. It is likely that people experienced with the Australian situation recognized *Panaeolus cyaneoscens* (i.e., *Copelandia cyaneoscens*) growing in the New Plymouth sand dunes, particularly at Khomeii beach, which is popular with surfers. At about the same time, a botanist from the United Kingdom recognized *P. semilanceata* (Liberty Caps) growing on the Otago peninsula near Dunedin City on the South Island. The botanist informed a circle of friends with an interest in psychedelics, and the knowledge of this location spread rapidly by word of mouth.

Thus, it was not until 1982 that articles — with titles such as "Magic Mushroom Danger Warning" (Unsigned 1982b) — began to appear in the press, and occasional reports of prosecutions appeared. As in Australia, media reports were usually quite inaccurate in describing the effects of the mushrooms, while giving precise instructions as to where they could be found. For example, in the aforementioned newspaper article, a New Plymouth-based drug abuse officer was quoted as saying that "it [the mushroom effect] was like setting off a time bomb. . . . Most common was an instant 'high' which put stress on the respiratory and heart functions. . . . They were very dangerous. People had died from them." At the same time, there were reports on national television showing mushrooms being picked in the New Plymouth paddocks. Consequently, there was a sudden and dramatic increase in popular knowledge of the mushrooms, resulting in large-scale autumnal pilgrimages to this area.

As in the United States, the police were not to arrest mushroom pickers, and tended to avoid involvement unless specifically called by a farmer. Attempts to prosecute cases were hampered by the wording of the Misuse of Drugs Act of 1975, which declared *P. mexicana* and *P. cubensis* — neither of which have ever been found growing in New Zealand — to be prohibited plants, while psilocybin and psilocin were Class A substances (the most severe). Most judges, with one notable exception (Unsigned 1986a), felt that a mushroom was not a substance (i.e., chemical) and thus prosecutions tended to fail. For this reason, an amendment to the Act was passed in early 1988 declaring that all members of the genera *Psilocybe* and *Panaeolus* were prohibited plants. This has not, however, led to a marked increase in prosecutions, and sentences

continue to be mild.

New Zealand is an isolated country with a prolific native flora. While the importation of cattle may have been responsible for introducing *P. cyanescens* to New Zealand, there are at least five indigenous species, four of which have yet to be described in detail and named (Johnson & Buchanan 1988). The fifth is *P. novae-zelandiae*, which has been characterized by Guzmán (1983). *P. novae-zelandiae* is found primarily in the native forests of the southern South Island.

P. cyanescens (Blue Meanies) predominates in the New Plymouth region, an area of intensive dairy farming. The mushrooms appear in autumn, most commonly under lupin bushes in coastal paddocks. On the lower South Island, particularly the Otago area and Dunedin City, the species consumed by users is *P. semilanceata* (Liberty Caps).

Insofar as epithets are concerned, the most popular term is "Magic Mushrooms." Neither the Australian term "Gold Tops" nor the English and American "Liberty Caps" has been widely adopted, although the term "Blue Meanies" is occasionally used to refer to *P. cyanescens*. In a study involving in-depth interviews (and follow-up questionnaires) of 150 people carried out between 1982 and 1989 throughout New Zealand (Jansen, Allen & Merlin 1991), it was clear that many users knew that Gold Tops referred to an Australian mushroom (*P. cubensis*) that was different from those used in New Zealand.

In the study referred to above, the only case requiring emergency room treatment was a musician who, due to impaired coordination, had fallen and cut his head. The hospital staff was not told of his intoxication, he was sutured without difficulty, and departed the emergency room with his companions. All persons in the study were asked if they knew of anyone who had required acute medical treatment, and with the exception of this case there were no other instances known to those in the sample. One of the present authors (Jansen) is not aware of any reported case histories in the New Zealand medical literature. However, three of the 150 cases (approximately 2%) suffered prolonged psychological difficulties following their mushroom experiences. Two of these cases involved the precipitation of a severe paranoid psychosis, eventually requiring psychiatric treatment that was still in progress at the time of the interview. In both cases there were predisposing features but there was clearly no preexisting psychosis. However, following the mushroom experiences there was frank and prolonged psychosis. These cases illustrate a caveat that has often been made concerning psychedelic drugs (e.g., Grinspoon & Bakalar 1981): there are certain persons who are psychologically at serious risk from these substances and must be urged to avoid them.

In terms of physical effects, no evidence was found to support the claims made in the danger-warning article

(Unsigned 1982b) that psilocybian mushrooms placed a major stress on the heart and respiratory system; nor is there any evidence of any deaths occurring in New Zealand due to psychoactive mushroom ingestion. There were several descriptions of a very rapid onset of the altered state that might be described as an instant high, but nothing to indicate that this was a serious threat to health.

The major physical danger from ingesting psychoactive mushrooms in New Zealand arises from the use of fungicidal and other agricultural sprays (e.g., Young et al. 1982), which have been used on both the North and the South Island by farmers and law enforcement authorities. One of the present authors (Jansen) has attended a person in his home who was suffering from marked weakness of the respiratory muscles, with accompanying shortness of breath, following ingestion of sprayed mushrooms. The signs and symptoms of poisoning continued for at least 18 hours after the return of a normal mental state, indicating that the muscle weakness was unlikely to have been due to psilocybin, which may sometimes cause acute weakness. Others ingesting the mushrooms from this paddock also suffered various forms of muscle weakness (e.g., lazy eyelid, which is extremely unlikely to have a psychological origin), extending in all cases for many hours beyond the end of the change in consciousness. In several cases, strong and robust men who had extensive experience with psychedelic drugs collapsed while crossing the road due to severe muscle weakness — a potentially life-threatening situation. Thus, it is clear that spraying mushrooms represents a greater public health threat than the mushrooms themselves, and this practice should be discontinued.

Finally, it was suggested by several persons in the study that the Maori (the native New Zealanders) may have used psychoactive mushrooms. This possibility was also mentioned by Wasson on a visit to New Zealand, in relation to the theory that concepts of divinity may have arisen in primitive peoples from psychedelic drug experiences (see Wasson 1986). In fact, there is no evidence to support the use of these mushrooms by the pre-Conquest Maori. The Maori are apparently distinctive for having used no consciousness-altering drugs. This conclusion was supported by all of the professors of Maori studies in New Zealand, and many other scholars of the Maori culture, in a series of consultations that occurred in 1988. It appears that the Maori culture represents at least one instance of a complex and rich theology and mythology, involving priests (*tohungas*) and the frequent invocation of deities in daily life that did not require the use of consciousness-altering chemicals.

CONCLUSION

A study was conducted by the present authors to investigate the deliberate and accidental consumption of psy-

choactive fungi in Australia and New Zealand. There are at least 15 species of mushrooms containing psilocybin and/or psilocin in Australia that are ingested for inducing hallucinogenic experiences; in New Zealand, at least eight psychoactive fungi species are known and used. Although the use of these psychoactive fungi appears to be widespread in Australia and New Zealand, there is a lack of quantitative data pertaining to the distribution and frequency of their consumption.

Three recent surveys in the United States pertaining to the recreational use of psychoactive fungi indicate that the use of these mushrooms is most prevalent among teenagers, young adults, and college students (Schwartz & Smith 1988; Unsigned 1986b; Thompson et al. 1985). One of the present authors (Allen) also reported that these fungi are still popular among surfers (e.g., cases 28 and 29), citing personal communications with young adults from Australia and New Zealand who were interviewed on Oahu in Hawaii. It appears that a network of communication exists among those who consume psychoactive fungi. Knowledge of these fungi within various age groups has spread by personal communication among friends. Media attention given to reported mushroom-poisoning incidents, announcements of seasonal availability of the fungi, and information in the existing literature devoted to psychoactive mushrooms have contributed to increased awareness of their presence and effects.

In Australia, the majority of psychoactive fungi seem to grow in Queensland, New South Wales, Victoria, and to a lesser degree South Australia, but several of the species (see Appendix) have been collected in all of the Australian states, including Canberra, Australian Capital Territory. Use of these fungi also occurs on both the North and South Islands of New Zealand.

Most of those who consume psychoactive fungi do not know the Latin names given to these species; hence the common epithets, such as Magic Mushrooms (the most common and generic term used for psychoactive fungi), Gold Tops (usually referring to *Psilocybe cubensis*), Blue Meanies (usually referring to *Copelandia cyanescens*), and Liberty Caps for *P. semilanceata*.

Published medical reports of cases involving psilocybian mushroom poisoning are often hampered by a lack of proper identification of the particular species of mushroom that was consumed. This, in turn, impedes proper medical diagnosis, which results in delayed treatment (e.g., Allen 1988b; Unsigned 1981). Most dysphoric reactions apparently are the result of (a) improper dosage, (b) unfavorable set and setting or (c) emotional and recurring psychological problems often associated with a past history of polydrug abuse.

Cases 1 through 7 were the result of ingesting *Panaeolus* spp. and required minor supportive treatment. The symptoms described correspond to those mentioned

in early medical journals as being common to *Panaeolus* intoxication.

From all the published material of the past century, the present authors have come to the conclusion that the effects following the ingestion of *Panaeolus* spp. appear to be more tranquil and less intense than the sometimes overwhelming hallucinatory effects attributed to the consumption of certain species of *Psilocybe*, which may be frightening, sometimes causing dysphoria and confusion when taken in excessive doses.

Case 8 involved the first reported use of *P. cubensis* on the continent. While these incidents occurred prior to 1963, it does support the assumption that psilocybian fungal use in Australia occurred at least eight years before its popularity in the Pacific Northwest of the United States.

Case 13 represents attitudes toward mushroom pickers who trespass on private property in search of fungi. In this case, four men were charged with possession of psilocybian mushrooms. They willingly accompanied the arresting officers, went before a judge, were convicted, and given a fine in lieu of a jail sentence for their offense. In Florida, as in Canada and Great Britain, possession of psilocybian mushrooms is currently not illegal. Judges in these areas have ruled that psilocybin and psilocin are chemicals, while mushrooms, regardless of any psychoactive content, are simply mushrooms. Although this is presently accepted, the law states that the chemical substances are illegal to possess. However, very few if any prosecutions take place in the United States, Great Britain, and Canada for these offenses. This apparently is also true for both Australia and New Zealand.

Cases 17 and 18 involved consumption of psychoactive mushrooms by children. No mention is made in either case as to whether or not these fungi were given to children as part of a meal or were ingested accidentally.

While documentation exists regarding users who sought medical treatment, it should be mentioned that many may be afraid to seek medical aid because of fear of prosecution. An example of this is the teenager who died on Whidbey Island, Washington, from eating a poisonous variety of fungi that she thought was a *Psilocybe* species. For more than two days she and her companions were afraid to report their illness to the proper medical authorities, which resulted in delayed treatment and death (Allen 1988b; Unsigned 1981). Drug educators, especially teachers in public schools, and those who are involved in drug abuse treatment programs should inform their students or patients that doctors and hospitals will not report their activities to law enforcement agencies when treating them for adverse drug effects.

There is also no evidence indicating that the sale of common, commercial mushrooms (e.g., *Agaricus bisporus*=*A. brunneus* Peck and/or *A. campestris* Fries) adulterated with LSD or PCP are sold in Australia or New

Zealand. However, this was reportedly a common situation in the United States for several years (Ott 1978), and may continue today. These fake magic mushrooms have been referred to as *Psuedopsilocybe hofmannii* (Ott 1978). Similar adulterated fungi have also been reported in Germany (Allen & Merlin 1990a; Stijve 1990; Stahl, Brombeer & Eskes 1978).

In summary, published reports that have appeared over the past 30 years indicate that numerous species of mushrooms containing psilocybin and psilocin are being consumed for recreational purposes in both Australia and New Zealand. Their use may continue to grow as more and more individuals become aware of their existence.

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APPENDIX

PSYCHOACTIVE FUNGI IDENTIFIED FROM AUSTRALIA AND NEW ZEALAND*

Amanita muscaria (L.:Fr.) Hooker (1821)

Documented locations: Common in Australia (Hall 1973); South Australia; Tasmania (Shepherd & Hall 1973). In New Zealand it is largely confined to stands of pine trees.

Copelandia cyanescens (Berk. & Br.) Singer (1948)

Documented locations: Darwin, Northern Territory (Australian Royal Commission 1980; Pollock 1975; Southcott 1974; Hall 1973); Adelaide, South Australia (Southcott 1974); New South Wales (Shepherd & Hall 1973); Brisbane, Gailles, and Brookfield, Queensland; Coffs Harbour, Rouse Hill, and Sydney, New South Wales (Young 1989b); Tasmania; and Auckland, New Zealand (Southcott 1974; Hall 1973). This species has a cosmopolitan distribution and occurs in the tropics and neotropics of both hemispheres. According to Weeks, Singer and Hearn (1979) and Guzmán (1978), this species has seven binomials, excluding *C. anomalus* (Murr.) Sacc. & Trott. It is commonly found in the dung of cows and sometimes horses along the coastal strip of eastern Australia north of Sydney, and also in tropical northern Australia. In New Zealand, this species is mainly found on the west coast of the North Island in the New Plymouth area, especially in the paddocks near the airport and in the dunes at Khomeii Beach. It is also found at Whatipu Beach near Auckland and some west coast beaches near Wellington (Otaki and Foxton). They tend to occur in the lupin-covered zone between pasture and sand. The New Plymouth lupins have recently been decimated by disease and the effect on fungal growth has yet to be determined.

Gymnopilus junonius (Fr.) Orton: see *Gymnopilus spectabilis*

Gymnopilus purpuratus (Cooke & Masse) Singer 1951

Documented locations: Port Lincoln and Big Swamp, South Australia (Cleland 1934); and South Australia, Victoria, and Western Australia (Shepherd & Totterdell 1990). This species was first identified from Australia by Cleland as

Flammula purpurata (derived from the Latin word *purpuratus*, clad in purple). Cleland described this species as being found on fallen tree trunks. Shepherd and Totterdell reported that it grows gregariously on rotted wood and that it blues easily. First collected in Chile, Singer (1969) identified *G. purpuratus* as an agaric from the Austral Floral Zone, and noted its bitter taste. Chemical analyses of this species by Gartz (In press, 1989), Gartz and Muller 1990, and Kreisel and Lindequist (1988) have found high levels of psilocin and psilocybin, and low levels of baeocystin. Gartz also found that this species was exempt of other tryptamines, muscarin, and urea, and stained blue when handled.

Gymnopilus spectabilis (Fr.) Smith (1948)

Documented locations: Australia (Southcott 1974) and Victoria (Willis 1963). Because this species is very bitter and has a most foul and acrid taste, and requires a dose of at least four to eight fresh ounces (112-224 g) of mushrooms for its desired psychoactive effects, it is unlikely that this species is collected in Australia. This species can be found fruiting on dead tree stumps. According to Watling (1989) and Sinnst (1976), this Australian species is probably subspecies *G. pampeanus* (Speg.) Singer. The latter species is widespread, at least in New South Wales, Queensland, South Australia, and Victoria (Young 1989b).

Panaeolina foenicisii (Pers.:Fr.) R. Maire (1933)

Documented locations: Blackbutt, Queensland (Young 1989a); Campbelltown, an eastern suburb of Adelaide, South Australia (Southcott 1974); Pemberton, Western Australia; and Sydney, New South Wales (Young 1989a). Watling (1979) collected specimens from Western Australia, suggesting that it was introduced by cattle imported from Europe, and Cleland (1934) identified this species from New South Wales, and Adelaide, South Australia. According to Guzmán (1989), "this species is probably not hallucinogenic" (cf., Allen & Merlin 1990a). This has also been confirmed by Stijve (1989), Watling (1989), Young (1989a), and Gartz (1985). It is a common lawn-inhabiting species with a cosmopolitan distribution. In New Zealand, *P. foenicisii* has a cosmopolitan distribution in pasture land.

Panaeolus antillarum (Fr.) Dennis

Documented locations: Northern rivers of New South Wales around Murwillumbah, and Eudlo, Queensland. Young (1989a) reported it from Queensland; Shepherd and Hall (1973) reported this species from Victoria, New South Wales, and South Australia. It was first identified by Cooke and Masse in 1889 as *Agaricus ovatus*, and later by Cleland (1934) who provided a more descriptive identification. The original collection of this species was examined by Pegler (1965) and he believed that this species is a *Panaeolus*. Pollock (1976) believed that Cleland's description was insufficient in describing *P. ovatus*, and considered that *P. [Copelandia] cyanescens* was actually the mushroom responsible for the numerous intoxications attributed to the so-called Hysteria Fungus, then known as *P. ovatus*. This is quite possible inasmuch as both species often grow side by side and may be confused. Aberdeen and Jones (1958) believed that *Psilocybe cubensis* may have been the fungus that caused the hysteria intoxications, and reported that *P. ovatus* was closely related to and possibly identical with *Anellaria sepulchralis* (Berk.) Singer, which according to Singer (1975) is generally considered edible. Both *P. ovatus* and *A. sepulchralis* are now considered to be synonyms of *P. antillarum*. Ola'h (1969) believed that *A. sepulchralis* is identical with *P. phalaenarum* (Fr.) Quelét; however, according to Guzmán (1972), *A. sepulchralis* is conspecific with *P. antillarum* (Fr.) Dennis, rather than *P. phalaenarum* because these latter two species are distinct. Some authors (Lincoff & Mitchell 1978; Ott & Guzmán 1976; Singer, Smith & Guzmán 1958) have suggested that *A. sepulchralis* contains psilocybin. This is a dung-inhabiting species.

Panaeolus cyanescens: see *Copelandia cyanescens*

Panaeolus ovatus: see *Panaeolus antillarum*

Panaeolus subbalteatus (Berk. & Br.) Sacc. (1887)

Documented locations: Throughout Australia. Shepherd and Hall (1973) reported that *P. papilionaceus* (Bull.:Fr.) Quelét (which is also psilocybian) occurs in South Australia, Victoria, and Queensland. They also noted that *P. subbalteatus* was collected in New South Wales. According to Young (1989b), the presence of *P. papilionaceus* and *P. subbalteatus* in Australia has not been confirmed. *P. subbalteatus* has a cosmopolitan distribution, appearing infrequently in both the northern and southern hemispheres. It is commonly found in the dung of cattle and sometimes in lawns. It also fruits abundantly in composting and rotting hay, haystacks, stable shavings at racetracks and riding stables. This species has not been identified in New Zealand.

Psilocybe australiana Guzmán & Watling (1978)

Documented locations: New South Wales: near Canberra, Cotterdam, Blue Mountains west of Sydney; Tidbinbilla

Nature Reserve; near Sydney, Mt. Wilson. Fruiting in April, this species is gregarious on soil with wood or leafy debris, on tracks and roadsides, in *Pinus radiata* plantations or in temperate rain forests. Known only from around New South Wales. Guzmán (1983) reported that *P. australiana* is similar to *P. cyanescens* Wakefield.

Psilocybe collybioides Singer & Smith (1958)

Documented locations: Queensland; Hobart, Tasmania (Shepherd & Hall 1974; Hall 1973). Guzmán (1983) reported that this species only occurs in Argentina where it appears gregariously on humus or small sticks or leaves and debris on soil. In addition, he stated that the identification of this species by Hall (1973), Shepherd and Hall (1973) or Mead who collected it from Queensland, and by Wade who collected it from Tasmania (Guzmán & Watling 1983), and by Southcott (1974) who noted its occurrence in Tasmania, seems to be inexact. It is possible that this species is similar to or may be one of the three new species that were described by Guzmán and Watling (1978).

Psilocybe coprophila (Bull.:Fr.) Kummer (1871)

Documented locations: Throughout pastures in Australia, appearing infrequently in the dung of horses and cattle. In 1978, Guzmán reported that this species might be hallucinogenic. In a personal communication to one of the present authors (Allen), Guzmán (1988) wrote that he doubted if this species contained any psilocybin, but suspected that it most likely did contain some kind of toxic substance. In New Zealand, a species that may be *P. coprophila* occurs abundantly in close association with rotting *Macrocarpa* tree stumps and woodpiles at the pony club adjacent to Frankley Road School, New Plymouth. The mushroom that occurs at this site is definitely hallucinogenic (Jansen 1989). Guzmán and Watling (1978) mentioned that *P. tasmania* resembles *P. coprophila*.

Psilocybe cubensis (Earle) Singer (1948)

Documented locations: Springbrook at 2,000-foot elevation; River Brisbane at Indooroopilly, Brisbane, Carboolture, Beechmont, Queensland; and Hobart, Tasmania (Aberdeen & Jones 1958). *P. cubensis* is gregarious — rarely solitary or scattered — and is found on cow dung, sometimes on rich pasture soils. Some recreational users have reported picking this species in New Zealand. However, this finding has not been confirmed by others, and neither the present author (Jansen) nor the Department of Scientific and Industrial Research mycology section have found *P. cubensis* growing in New Zealand.

Psilocybe eucalypta Guzmán & Watling (1978)

Documented locations: New South Wales — near Canberra, Tidbinbilla Nature Reserve; near Queanbeyan, Talaganda Forest Reserve; near Sydney, Mt. Wilson. Fruiting in April, *P. eucalypta* grows solitary on soil or in small groups among grassy woody debris or among mosses in shallow groves of *Eucalyptus* forests. According to Guzmán (1978; 1983), *P. eucalypta* is similar to *P. cyanescens* Wakefield.

Psilocybe kumaenorum Heim (1967)

Documented locations: New Guinea. Although this species is known to appear only in New Guinea, Guzmán and Watling (1978) suspected that it is possible that it could occur in Australia. It grows gregariously on soil, in small groups, and in open places among grasses. Its suspected use among New Guinea aborigines has also been noted (Heim et al. 1967).

Psilocybe novae-zelandiae Guzmán & Horak (1978)

Documented locations: Canterbury, Mt. Grey, and Kowai Bush, New Zealand (Guzmán 1983). This species grows alone to caespitose in small groups on soil, under *Nothofagus cliffortioides* var. *N. solandri* and *N. fusca*. Guzmán (1983) did not mention this species as being hallucinogenic.

Psilocybe semilanceata (Fr.:Sacc.) Kummer (1871)

Documented locations: Australia; Mt. Field National Park, Tasmania (Guzmán 1983). *P. semilanceata* was first reported from Australia by Cooke (1892). McAlpine (1895) next reported it from New South Wales. In 1973, Shepherd and Hall documented its appearance from Victoria, and that same year Watling collected specimens from Tasmania (Guzmán & Watling 1978). Although this species is very common, well-known, and much prized by recreational mushroom enthusiasts throughout Europe, Scandinavia, Great Britain, Canada, the Pacific Northwest region of the United States, and South America, no reports of its use as a recreational drug in Australia existed until recently. It is probable that this species is known and used by members of the drug subculture in Australia. However, no published reports exist to indicate that it has ever been confiscated by narcotics officers on the continent or that its suspected use has been brought to their attention. *P. semilanceata* grows very scattered to gregariously on rich soil, among grass in pastures and meadows, and is frequently abundant around clumps of tall grass, including lawns, parks, and playgrounds. In New Zealand it grows alone but very rarely caespitose and is largely confined to the south of Cook Island, in particular the Otago Peninsula and Mount Cook.

There is a specimen in the Department of Scientific and Industrial Research collection that was found on a suburban lawn in Auckland. It has been used recreationally in New Zealand since the early 1980s.

Psilocybe subaeruginosa Cleland (1927)

Documented locations: Cleland (1927) first reported this species from National Park, Mt. Lofty, Morialta, and Water Fall Gully, South Australia, New South Wales, and Victoria. Other reported locations included Adelaide, Adelaide Hills, Mt. Lofty, South Australia (Guzmán & Watling 1983; Southcott 1974); New South Wales; Victoria (Shepherd & Hall 1973; Willis 1963); Australian Capital Territory (Picker & Rickards 1970); National Park, Belair, Mt. Field National Park, Tasmania (Guzmán 1983; Guzmán & Watling 1978) and on the pathway to Russell Falls. Fruiting during the summer months (April-August), *P. subaeruginosa* grows alone to gregariously on rich soil among grass, horse dung or on decaying leaves and twigs mainly in deeply shaded places. Picker and Rickards (1970) were the first to report the presence of psilocybin in this species, and three years later Hall (1973) reported its recreational use.

Psilocybe subcubensis Guzmán (1978)

Documented locations: Throughout Australia. *P. subcubensis* appears abundantly after heavy rains in Queensland, Breban, and near Lobouluse (Guzmán 1983). *P. subcubensis* is indistinguishable from *P. cubensis* except by the size of its spores. It is a pantropical and subtropical species, fruiting in summer but also in other seasons, and is found scattered on cow dung or partially decomposed dung in grassy places (pastures); it is more rarely found in rich soil. This species does not occur in New Zealand.

Psilocybe tasmaniana Guzmán & Watling (1978)

Documented locations: near Canberra, Tidbinbilla Nature Reserve, New South Wales; northeast of Hobart, Nugent, Buckland, Mt. Field National Park, Tasmania. Fruiting in April and May, *P. tasmaniana* grows alone or in small groups on dung or on debris (wood and leaves) intermixed with dung (sometimes kangaroo). This species was also collected from Mt. Field National Park (in a grassy area under trees with *P. semilanceata*) and in the New Plymouth area of New Zealand. *P. tasmaniana* is closely related to *P. subaeruginosa* (Guzmán & Watling 1978) but is somewhat similar to *P. cyanescens* Wakefield. According to Guzmán and Watling (1978), this species macroscopically resembles *P. coprophila*.

Unidentified species have been collected from the Waitakere ranges, growing in native forest near Auckland, and on the west coast of the South Island of New Zealand. Jansen (1989) reported that there are at least five unidentified species from New Zealand that are considered to be psychoactive. Margot and Watling (1981) reported an unidentified bluing *Psilocybe* species, with affinities to the North American *P. caerulipes* (Peck) Sacc., from New Zealand. Guzmán and Watling (1978) mentioned that *P. kumaenorum* is related to *P. caerulipes*.

*There is a small collection of psychoactive fungi specimens held at the Mount Albert (Auckland, New Zealand) Division of the Department of Scientific and Industrial Research.

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