GENRE AND FIELD: SOCIAL PROCESSES AND KNOWLEDGE STRUCTURES IN SYSTEMIC FUNCTIONAL SEMIOTICS

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1. Modelling field

Martin (2002) interprets field is a set of activity sequences oriented to some global institutional purpose, alongside the taxonomies of participants involved in these sequences (organised by both classification and composition). The Australian Government's Bureau of Meteorology's webpage[i] on clouds reflects these concerns in their discussion of Cloud formation and Cloud classification. Cloud formation focusses dynamically on activity, from the scientific perspective of meteorology:

> [1] Clouds have their origins in the water that covers 70 per cent of the earth's surface. Millions of tons of water vapour are evaporated into the air daily from oceans, lakes and rivers, and by transpiration from trees, crops and other plant life.
>
> As this moist air rises it encounters lower pressures, expands as a result, and in doing so becomes cooler. As the air cools it can hold less water vapour and eventually will become saturated. It is from this point that some of the water vapour will condense into tiny water droplets to form cloud (about one million cloud droplets are contained in one rain-drop). Thus, whenever clouds appear they provide visual evidence of the presence of water in the atmosphere.

Cloud classification focuses statically on relationships, in this case a meteorological taxonomy of cloud types:

> [2] There are ten main cloud types, which are further divided into 27 sub-types according to their height shape, colour and associated weather, Clouds are categorised as low (from the earth's surface to 2.5 km), middle (2.5 to 6 km), or high (above 6 km). They are given Latin names which describe their characteristics, e.g. cirrus (a hair), cumulus (a heap), stratus (a layer) and nimbus (rain-bearing). It's an interesting fact that all clouds are white, but when viewed from the ground some appear grey or dark grey according to their depth and shading from higher cloud.

Both orientations to clouds are in addition supported by images. Four different ways in which clouds are formed are outlined in diagrams involving dynamic vectors (Fig. 1).
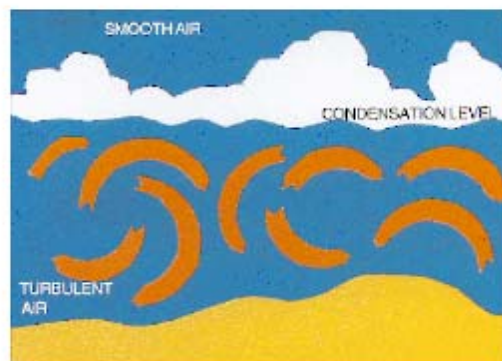
Orographic lifting occurs when air is forced upward by a barrier of mountains or hills.

Convective lifting occurs when air heated at the earth's surface rises in the form of thermal currents or bubbles.

Widespread ascent results from the interaction of air masses, or the movement of a cold air mass forcing warm air to rise ahead of it.

Mechanical (or frictional) turbulence occurs when the air flow is deformed into a series of eddies as it moves over the earth's surface.

Fig. 1: Four Ways in which Moist Air can be Lifted to Form Clouds

And the ten major cloud types are illustrated with photographs, arranged iconically according to cloud height as high, middle and low (Fig. 2). The captions on each photo include further information about shape and colour, and associated precipitation (if any). As Unsworth 2001 surveys for educational contexts, the field is realised multimodally, with image complementing verbiage. But the complementarity of activity sequencing and taxonomising holds true across modalities - since fields are about both what is going on, and who or what is involved in these activities.

Cirrus: high level, white tufts or filaments; made up of ice crystals. (No precipitation.)

Cirrocumulus: high level, small rippled elements; ice crystals. (No precipitation.)

Cirrostratus: high level, transparent sheet or veil, halo phenomena; ice crystals. (No precipitation.)

Altocumulus: middle level layered cloud, rippled elements, generally white with some shading. May produce light showers.

Altostratus: middle level grey sheet, thinner layer allows sun to appear as through ground glass. Precipitation: rain or snow.

Nimbostratus: thicker, darker and lower based sheet. Precipitation: heavier intensity rain or snow.

Stratocumulus: low level layered cloud, series of rounded rolls, generally white. Precipitation: drizzle.

Stratus: low level layer or mass, grey, uniform base; if ragged, referred to as "fractostratus". Precipitation: drizzle.

Cumulus: low level, individual cells, vertical rolls or towers, flat base. Precipitation: showers of rain or snow.

Cumulonimbus: low level, very large cauliflower-shaped towers to 16 km high, often "anvil tops". Phenomena: thunderstorms, lightning, squalls. Precipitation: showers of rain or snow.

For further information contact the Bureau of Meteorology in your State capital city.

Fig. 2: Types of Clouds Illustrated

Martin 2002 also includes some speculative discussion about relationships among fields, by way of exploring Bernstein's notion of common and uncommon sense. A provisional mapping of field-types is outlined in Fig. 3, taking into account everyday domestic, recreation and trades, administration, humanities, social science and science.
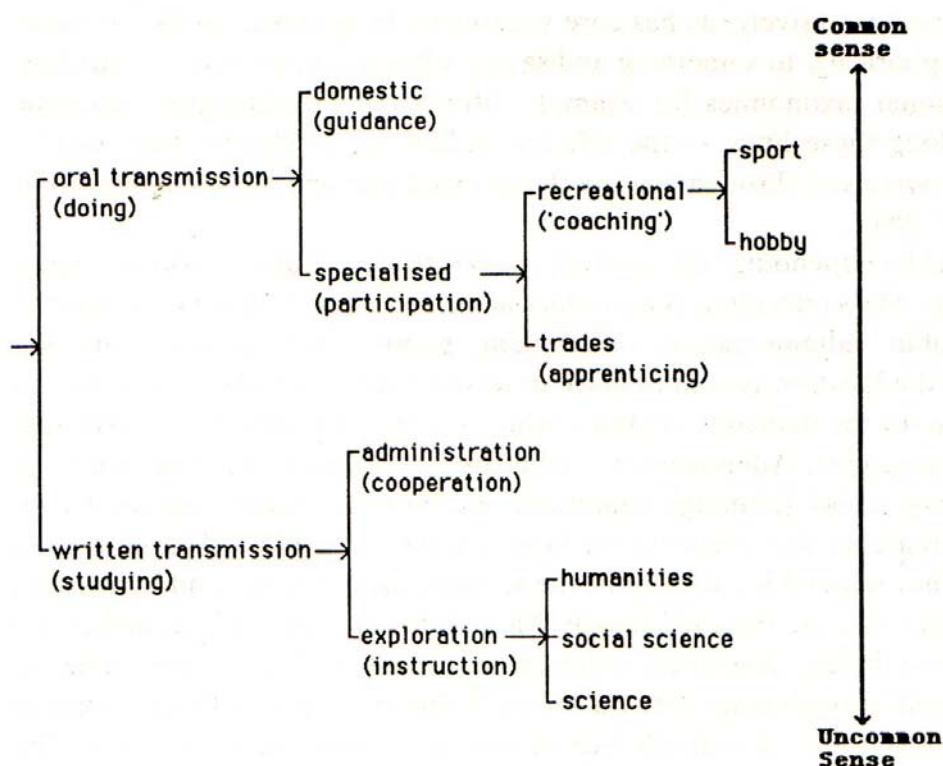

Fig. 3: Martin's 2002 Mapping of Fields in Relation to Uncommon Sense

He further speculates about the nature of the activity sequences and taxonomies associated with different positions on the cline (Fig. 4), taking into account the way they tend to be documented in writing (or

not) and the nature of the phenomena explored. These suggestions anticipate exciting developments by Bernstein and his colleagues with respect to the sociology of knowledge, which we will take up below.

	ACTIVITY SEQUENCES	TAXONOMIES
DOMESTIC (guidance)	implicit	"natural"
SPECIALISED (participation)	manuals	utilitarian (tools)
ADMINISTRATION (cooperation)	procedures	pragmatic (subjects)
EXPLORATION (instruction)	implication sequences	technical (things)

Fig. 4: Kinds of Field in Relation to Activity and Taxonomy

2. Common and uncommon sense (science)

The uncommon sense discourse of science was used to illustrate field as activity and field as taxonomy in section 1 above. Text 1 presented a scientific understanding of cloud formation, and text 2 a scientific understanding of cloud classification. Text 1 reconstrues the everyday word *cloud* as a scientific concept, and drew on related scientific understandings to do so (evaporation, transpiration, low pressure, water vapour, saturation, condensation). Text 2 reworks our everyday experience of clouds into a categorisation based on height, shape, colour and associated weather - introducing scientific categories to do so (cirrus, cumulus, stratus, numbus). The technical terminology encoding these understandings is perhaps the most striking 'surface' feature of scientific discourse.

This very technicality has the function of linking activity to taxonomy - of linking cloud formation to cloud classification for example. Messel 1963.7.7 describes warm fronts as follows, and then uses the image in Fig. 5 to label cloud types in relation to uplift.

[3] Warm fronts. When a warm air stream meets a colder air mass, the warm air, being less dense, slides up over the cold air and the temperature falls. Condensation generally ensues. The surface between the two air masses is inclined at a smaller angle than is the case for a cold front. See Fig. 7.8. Warm fronts are rare in Australia.

The approach of a warm front is heralded by the appearance of high, white, wispy clouds, known as **cirrus** cloud. As the front approaches, the clouds become lower and thicker, culminating in masses of heavy rain clouds. The weather usually clears quickly after the front has passed. However, a warm front is commonly followed, after an interval which may be anything up to a day or more, by a cold front. [Mesel 1963. 7.7]

Scientific explanations have been explored in detail by Unsworth (1997a, b, c, 1999, 2001, 2004) and we won't develop this aspect of scientific fields further here. As far as taxonomising is concerned we should emphasise that scientific taxonomies are much deeper than everyday ones. Where everyday discourse gives us perhaps clouds and rain clouds, Wikpedia (http://en.wikipedia.org/wiki/Cloud_types) refers to the following main cloud types:
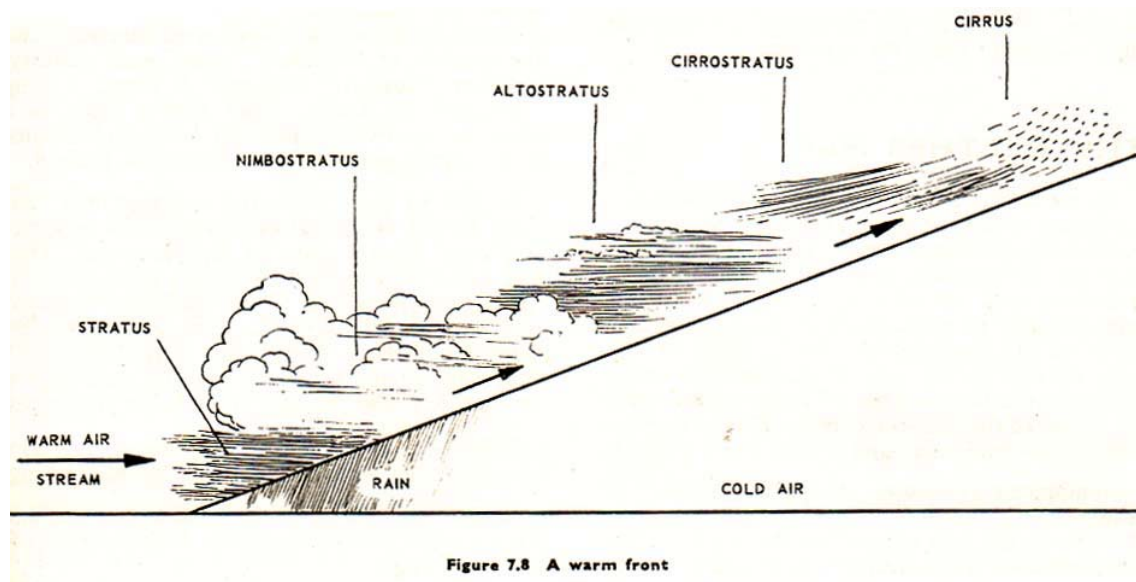

Figure 7.8 A warm front

Fig. 5: Warm Front Activity in Relation to Cloud Type [Messel 1963]

1 High-level clouds
- o 1.1 Cirrus
- o 1.2 Cirrocumulus
- o 1.3 Cirrostratus
- o 1.4 Contrail

2 Medium-level clouds
- o 2.1 Altostratus
- o 2.2 Altocumulus
- o 2.3 Nimbostratus

3 Low-level clouds
- o 3.1 Stratocumulus
- o 3.2 Stratus
- o 3.3 Cumulus

4 Vertically developed clouds
- o 4.1 Cumulonimbus

And any one of these can be broken down into further sub-types - altostratus clouds, which form when "a large air mass is condensed, usually from a frontal system, and can bring rain or snow", for example, are subclassified as follows:

altostratus duplicatus
altostratus lenticularis
altostratus mammatus
altostratus opacus
altostratus praecipitatio
altostratus radiatus
altostratus translucidus
altostratus undulatus

The depth and precision of classifications of this kind distinguishes taxonomising in science from taxonomising in everyday life. And comparable precision and delicacy is found for decomposition. We learn from text 1 that clouds are made of water droplets, and we can pursue this further into the realm of physics and atomic structure. There we learn that water is a V-shaped molecule, known chemically as H_2O (meaning two hydrogen and one oxygen atom bonded together into a molecule). Pushing further we might find that water molecules are symmetric, with two mirror planes of symmetry and a 2-fold rotation axis (http://www.lsbu.ac.uk/water/molecule.html); and this is probably already further than a high school physics challenged mortal like myself would like to go (cf. O'Halloran 2006 for a rich account of science and mathematics from someone not challenged in this way). I can't help,

however, finding the images modelling this uncommon sense composition intriguing (from the website just noted).

The approximate shape and charge distribution of water.

Note that the average electron density around the oxygen atom is about 10x that around the hydrogen atoms.
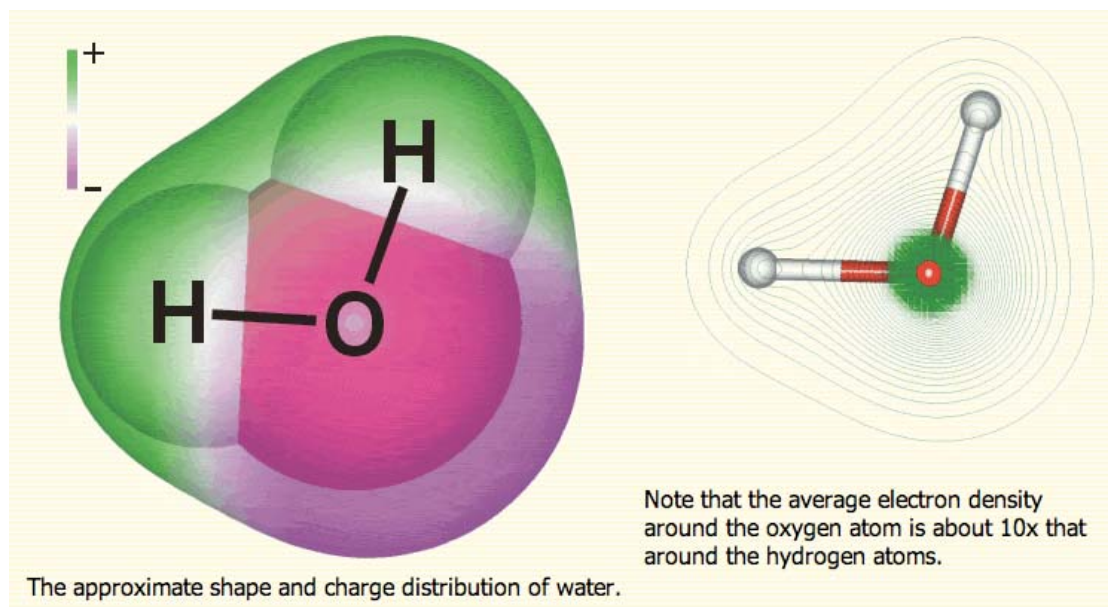
Fig. 6: Uncommon Sense Composition of the Water Molecule

Alongside depth and precision, we also need to keep in mind the criteria on which uncommon sense classifications and decompositions are based - namely technologically augmented perception, over various depths of time, in relation to meticulous record keeping (i.e. writing). Everyday taxonomising is based more simply on what we sense going on around us (by seeing, hearing, tasting, feeling, smelling); so we have clouds (which block the sun) and clouds that look like they might rain or snow (rain clouds, snow clouds), with no certain division between the two - and that's pretty much all that city-dwellers need to get through everyday life (alongside of course the unreliable fortune telling we tune in to during weather broadcasts, in print or electronic media of one kind or another, as we plan our recreational activities).

The evolution of the uncommon sense discourses of science in English and Chinese is outlined in Halliday 2004. Recontextualisations of these

in pedagogic discourse are explored in Eggins et al.1993, Halliday & Martin 1993, Martin 1993a, b, Martin & Veel 1998.

3. Common and uncommon sense (history)

One of the first things we notice when we move from the field of science to the field of history is the relative absence of technicality. We do find some borrowed terminology, from say Marxism (e.g. *capitulationist tendencies, material aspirations, ideologues of the emerging elite, demands of the masses*) or critical theory (e.g. *discourse, narrative, subject, Law, desire, interrogation, power).*   And specialised bureaucratic classifications are regularly drawn upon (*South Australian police, Australian Federal Police, High Court of Australia, Federal Magistrates Courts*), often in the form of acronyms:

DIMIA   Dept of Immigration, Mutlicultural & Indigenous Affairs
DFAT   Dept of Foreign affairs & Trade
DEET   Dept of Employment, Education and Training
HREOC   Human Rights & Equal Opportunity Commission

For the most part however, historical classification is a matter of instantial classification in texts. In text 4 for example, Mares interprets Ruddock, the then Australian Minister for Foreign Affairs, as presenting three models of immigration. These scenarios are clearly outlined in the text, but are not technicalised. Mares does not feel the need to introduce and define terms for each, which means that Ruddock's vision will not transcend this particular presentation and move into general consciousness. The classification is left to reside in the text itself, from which it will have to be recovered by future readers.

> [4] The minister moves on to outline **three competing visions** for Australia's population in the century ahead. **The first scenario** is the high-immigration model favoured by some business groups, which call for Australia's net migration intake to be set at 1 per cent of existing population per year... **The second scenario** is net zero migration, the model pushed by sections of the environmental movement and by groups such as One Nation, which say that Australia should take just enough migrants to replace the number of people who permanently depart the country each year... **The minister's final forecast** is reassuring – according to him, if we hold fast to the current government policy, Australia's population will increase gradually for the next forty years before settling comfortably at around 23 million... [Mares, P 2001 *Borderline:*

Australia's treatment of refugees and asylum seekers. Sydney: UNSW Press (Reportage Series) 141-142]

Historical composition is different story. As far as people, places and things are concerned, we find the same pattern as with classification - historians borrow technicality (e.g. geographical locations, the structure of government agencies), but they don't create it. It is for activity however that uncommmon sense composition comes to the fore (Martin 2002a, 2003).

Obviously history is concerned with what has happened in the world. And there are certainly occasions when the temporal sequencing of specific events has to be chronicled in some detail. In text 5 for example, Brennan presents part of the sequence of events whereby the Australian government prevented a cohort of asylum seekers from landing on Australian soil. His reason for doing this is to document for the historical record the shameful mendacity of the Australian government of the time. In [5] the forward pointing arrows point to events which follow in time, and backward pointing arrows to events which precede.

[5] On 29 August the *Tampa* entered into Australian territorial waters approaching Christmas Island. → The prime minister told parliament that ← the captain had decided on this course of action because ← a spokesman for the asylum seekers 'had indicated that they would begin jumping overboard if medical assistance was not provided quickly'. → Captain Rinnan gave a different reason for this decision: 'We weren't seaworthy to sail to Indonesia. There were lifejackets for only 40 people. The sanitary conditions were terrible.' → The SAS came aboard and took over *Tampa*. → An Australian Defence Force doctor was given 43 minutes to make a medical assessment of the 433 asylum seekers. → He reported, 'Four persons required IV (2 urgent including 1 woman 8 months pregnant).' → Captain Rinnan was surprised at the prompt medical assessment, because ← his crew had already identified ten people who were barely conscious lying in the sun on the deck of the ship. → The prime minister then made a finely timed ministerial statement to parliament insisting that ← 'nobody – and I repeat nobody – has presented as being in need of urgent medical assistance as would require their removal to the Australian mainland or to Christmas Island'. → One hundred and thirty-one fortunate asylum seekers were granted immediate asylum by the New Zealand government. → The rest, ← having been transported to Nauru, waited processing under the evolving Pacific Solution. [Brennan 2003: 42-43]

Texts featuring this kind of detailed sequence in time are relatively rare in history discourse, since historians are responsible for a multitude of overlapping activities unfolding through long passage of time. The Tampa episode, referred to in [5], is just one moment in the history of people arriving in Australia by boat to seek political asylum. Brennan outlines a much longer phase of this activity as follows:

[6] *The first wave* of 2,077 Indochinese boat people came to Australia in 54 boats **between 1976 and 1981**. **In that time**, Australia was to resettle another 56,000 Indochinese through regular migration channels. The first boatload of asylum seekers arrived in Darwin harbour **on 28 July 1976**. The five Vietnamese had made the 6,500-kilometre journey in a small boat. **At the end of that year** another two boats arrived carrying 106 people who were screened for health reasons and then flown to Wacol migrant hostel outside Brisbane. **When the third Vietnamese boat of the first wave arrived**, there was some media agitation about the threatened invasion by boat people. One Melbourne newspaper reported that 'today's trickle of unannounced visitors to our lonely northern coastline could well become a tide of human flotsam'. The paper asked how the nation would respond to 'the coming invasion of its far north by hundreds, thousands and even tens of thousands of Asian refugees". The invasion never occurred.

In 1978 the Communist government in Vietnam outlawed private business ventures. Tens of thousands, mainly ethnic Chinese, then fled by boat. The outflow of Vietnamese boat people throughout the region gave rise to great moral dilemmas in the implementation of government policies. Countries such as Malaysia would periodically declare that their camps were full and they could take no more boat people. They would even threaten to shoot new arrivals on sight. Alternatively, they would provide them with food, fuel and repairs so they could set off for another country. Meanwhile Vietnamese officials were profiting by charging the boat people high departure fees.

Camps were filling around Southeast Asia. There was no let-up in the departures from Vietnam. **In the end** there was a negotiated agreement involving Vietnam, the countries of first asylum such as Thailand and Malaysia, and the resettlement countries, chiefly the United States, Canada and Australia. **In 1982** the Australian government announced that the Vietnamese government had agreed to an Orderly Departure Program. Australian immigration ministers Michael MacKellar and Ian MacPhee were able to set up procedures for the reception of Vietnamese from camps in Southeast Asia as well as those coming directly from Vietnam under a special migration program. With careful management, they were able to have the public accept up to 15,000 Vietnamese refugees a year when the annual migration intake was as low as 70,000. [Brennan: 29-30]

In texts of this kind, instead of moving sequentially from one specific event to another as in [5], we hop selectively from one significant phase of activity to another. This is scaffolded by circumstances of location in space, typically in clause initial position, which tell us where we are (e.g. *between 1976 and 1981, in that time, on 28 July 1976, at the end of that year*). And as we can see from Brennan's reference to these activities as *the first wave* of boat people, there are more waves to come. He moves on in fact to consider four waves, each of which is broken down into phases of time, as outlined in Fig. 7 (from Martin & Rose 2006).

The first wave of 2,077 Indochinese boat people came to Australia in 54 boats É

> The **first boatload** of asylum seekers arrived in Darwin harbour **on 28 July 1976**.

> **At the end of that year another two boats** arrived carrying 106 people É

> **When the third Vietnamese boat of the first wave arrived**, there was some media agitationÉ

> **In 1978** the Communist government in Vietnam outlawed private business venturesÉ

> **In the end** there was a negotiated agreementÉ

> **In 1982** the Australian government announced that the Vietnamese government had agreedÉ

> **In 1978** the government set up a Determination of Refugee Status (DORS) CommitteeÉ

> **In the early 1980s** the committee considered fewer that 200 applications a year...

> **In 1982** the government decided that even offshore cases would be decided on a case by case basisÉ

> **At the same time** the government set up a Special Humanitarian ProgramÉ

> **The In the first year**, there were 20,216 offshore refugeesÉ

> **Within eight years** there were only 1,537 under the offshore refugee categoryÉ

> **Initially** it was assumed that there would be only a few hundred of such onshore cases a yearÉ

> **In 1985** the High CourtÉ decided that ministerial decisionsÉw ere reviewable by the courtsÉ

The second wave of boat people commenced with the arrival of a Cambodian boatÉ

The third wave of boat people arrived between 1994 and 1998É

The fourth and biggest wave of boat people in modern Australian history could not be so readily categorisedÉ
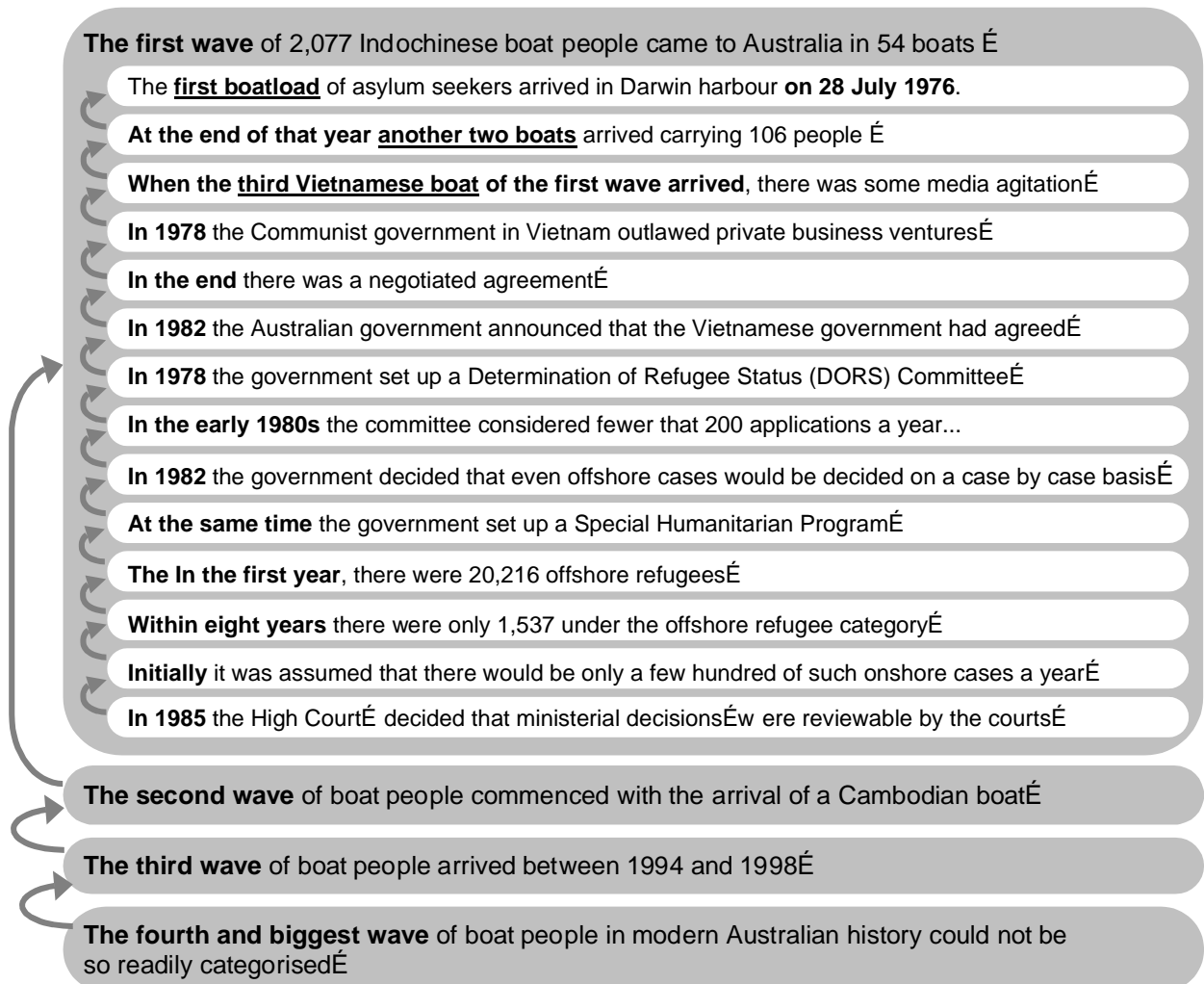
Fig. 7: Brennan's Phases of Historical Activity

The critical point here is that although Brennan doesn't name phases within his four waves, he does name the waves themselves. This in effect turns a lot of activity into a thing - four things in fact, which taken together make up his history of the boat people. As with Ruddock's classification of scenarios discussed above, Brennan's composition remains an instantial one, recoverable from his book but not beyond. But naming affords the possibility of technicalisation, and this is certainly what has happened for the Tampa episode, a part of which was sequenced in text 5. That particular phase of Australian immigration history has transcended the texts in which it is construed, Comparable technicalisations of phases of history with which many are familiar would include the Middle Age, the Rennaissance, World War I, the Treaty of Versailles, the Long March, the Cultural Revolution, or more specifically, for Australian readers, the Dismissal, Mabo, Bodyline, Kokoda, Lone Pine and so on.

Compositionally speaking then, uncommon sense history turns a multitude of overlapping and successive events into a thing divided into phases, which may be named (e.g. *the first wave*), and possibly technicalised (e.g. *Tampa*). This reification processes allows for phases to be grouped and divided, until a requisite compositional hierarchy is construed.

Of course history has to do more than simply fashion the past as an episodic chronicle; it also has to explain. To this end, causality is by and large handled inside rather than between clauses, taking advantage of experiential resources realised through transitivity structures (rather than logical resources realised through conjunctive links in clause complexes). The follow pattern is typical in that is involves two nominalised events (*outflow* and *implementation*) causally related by the process *give rise to*.

> **The outflow** of Vietnamese boat people throughout the region
> **gave rise to**
> great moral dilemmas in **the implementation** of government policies

Realising cause inside the clause in this way enables historians to fine tune causality by deploying verbs which can finely differentiated types of cause and effect relations (e.g. *argue, act, attract, spark*). Manne

begins text [7] in just these terms, with *unwillingness* related to *response* via a strong causal process of 'determination'.

> The Howard government's **unwillingness** to apologise
> <mark>**determined**</mark>
> the nature of its **response** to other recommendations contained in *Bringing them home*.

Since he is writing popular history, he then unpacks this intra-clause causality as three inter-clausal causal connections realised by *because*. This makes the reasoning more like the reasoning we are all familiar with from spoken discourse.

> [7] The Howard government's unwillingness to apologise **determined** the nature of its response to other recommendations contained in *Bringing them home*.
>
> **Because** it refused to consider the present generation of Australians legally or morally responsible for the mistakes of the past,
>> it refused altogether *Bringing them home's* recommendation for financial compensation for members of the stolen generations.
>
> **Because** it thought the policies of child removal had been lawful and well-intentioned,
>> it treated almost with contempt the arguments in *Bringing them home* which suggested that in removing Aboriginal children from their families by force previous Australian governments had committed serious violations of the human rights treaties they had signed or even acts of genocide.
>
> **Because**, nonetheless, it accepted that the Aboriginal children who had been taken from their families had suffered serious harm
>> it was willing to allocate modest sums to assist members of the stolen generations with psychological counselling, family reunion, cultural projects, oral histories and so on.

The price Manne pays for his popularisation is that he has to keep repeated the same causal connection over and over again (*because, because, because*). There are certainly moments in history when a simple causal relation such as this is enough, although even there historians prefer to explain within rather than between clauses.

> The wide reporting of the violence
> <mark>**had caused**</mark>
> concern to grow among the politically powerful missionary societies in Britain

The narrow selection of sources
results in
a profound ignorance of the basics of Van Diemanian economy, society and...

which in turn
leads
to a series of elementary errors.

The wide reporting of the violence
had caused
concern to grow among the politically powerful missionary societies in Britain

Elsewhere, variations on roughly the same structural configuration afford a range of nuanced cause and effect relations.

The over-reliance on the government's own records
grossly distorts
Windschuttle's understanding of the realities of frontier life for two reasons.

'very considerable difficulties
arise from
the insufficiency of stationery'.

Government record keeping
improves somewhat
with the arrival of Sorrell in 1817

the detention in remote places
were contributing to
more regular bad decision making at the primary stage

the savings from not holding unlawful arrivals in protracted detention…
could be devoted to
increased surveillance of all overstayers in the community

This (= increased surveillance of all overstayers in the community)
would facilitate
the orderly departure from Australia of overstayers

Managing causality along these lines depends on control over grammatical metaphor, so that events can be nominalised as things and related verbally to one another (Coffin 2006, Halliday & Matthiseen 1999, Martin 1993a, b, 2002a, 2003, 2007). It is this process which creates the resources which historians depend on to explain.
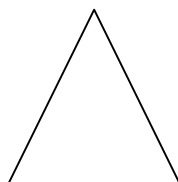
4. Knowledge structure: a sociological perspective

Recently the SFL tradition of field differentiating research has been brought into dialogue with the rich sociological perspective on knowledge structure inspired by Bernstein 1996/2000 and developed by Muller 2000. Christie & Martin 2007 document significant moments in this exchange. Bernstein is himself developing his earlier common vs uncommon sense opposition which inspired much of the SFL research. He begins by distinguishing between everyday horizontal discourse and the vertical discourses of the humanities, social science and science.

> A *Horizontal discourse* entails a set of strategies which are local, segmentally organised, context specific and dependent, for maximising encounters with persons and habitats....This form has a group of well-known features: it is likely to be oral, local, context dependent and specific, tacit, multi-layered and contradictory across but not within contexts. [Bernstein 2000:157]

> ...a *Vertical discourse* takes the form of a coherent, explicit and systematically principled structure, hierarchically organised as in the sciences, or it takes the form of a series of specialised languages with specialised modes of interrogation and specialised criteria for the production and circulation of texts as in the social sciences and humanities. [Bernstein 2000:157]

Then, within vertical discourse, he distinguishes between the hierarchical knowledge structures characteristic of science and the horizontal knowledge structures of the humanities. Bernstein uses the image of a triangle below to symbolise hierarchical knowledge structure (definitions from Maton & Muller 2007).

> A **hierarchical knowledge structure** is "a coherent, explicit and systematically principled structure, hierarchically organised' which 'attempts to create very general propositions and theories, which integrate knowledge at lower levels, and in this way shows underlying uniformities across an expanding range of apparently different phenomena" (1999: 161, 162).

> A **horizontal knowledge structure** is defined as "a series of specialised languages with specialised modes of interrogation and criteria for the construction and circulation of texts" (1999: 162).
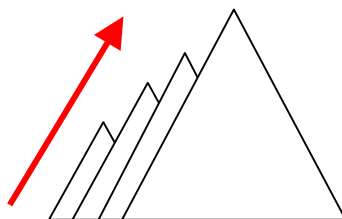
$$L^1 L^2 L^3 L^4 L^5 L^6 L^7 ... L^n$$

Bernstein's indefinitely extendable listing of Languages is meant to characterise the proliferation of theories in a field like linguistics, where a theory such as SFL co-exists with related 'functional' models such as Lexical Functional Grammar (LFG), Role and Reference Grammar (RRG), Functional Grammar (FG) and Cognitive Linguistics, alongside various formalist paradigms.

Wignell 2007 argues social sciences are better characterised as warring triangles, since each language models itself in some respect on science and tends not to get along very well with alternatives:

This distinguishes the social sciences from the **humanities** where technicality and the drive to integration via general models and propositions is much less strong (but where similarly, competing segments are relatively intolerant of each other).
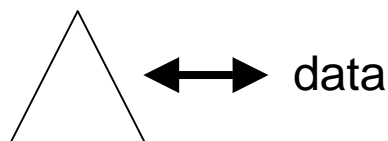
Muller 2007 proposes the term '**verticality'** to describe progression in the development of theories via ever more integrative or general propositions (extending Bernstein's notion of strong vs weak internal grammars of description). In his terms, hierarchical knowledge structures (canonically physics) would exhibit more verticality than the more aspirational languages of social science - a process we might image as follows:

Proliferating segments in the humanities on the other hand would exhibit very little verticality at all, since they progress via the introduction of a new language which constructs a 'fresh perspective, a new set of questions, a new set of connections, and an apparently new problematic, and most importantly a new set of speakers' (Bernstein: 1999: 162).

$$L^1\ L^2\ L^3\ L^4\ L^5\ L^6\ L^7 \longrightarrow L^n$$

In addition Muller proposes **'grammaticality'** to describe how theoretical statements in knowledge structures deal with their empirical predicates (extending Bernstein's conception of strong vs weak external grammars of description). The stronger the (external) grammaticality of a language in these terms, the more stably it is able to generate empirical correlates and the more unambiguous its claims because of a more restricted field of referents.

$$\triangle \longleftrightarrow \text{data}$$

For Muller segments of horizontal knowledge structures would have a much weaker relation to data, which might, as in the case of cultural studies or literary criticism, afford divergent readings no one of which can be shown to be empirically more adequate than another.

$$\mathbf{L} \dashleftarrow\dashrightarrow \textbf{texts}$$

As far as Bernstein's distinction of horizontal from vertical discourse is concerned, SFL's main contribution to date has been to identify **grammatical metaphor** as the key linguistic resource deployed to construe vertical discourse. As far as taxonomy is concerned, it enables classification by packaging up relevant information in nominal form so that terms can be defined and related to one another. Note for example the key packaging nominalisations, highlighted below, in Bernstein's definitions of the concepts we are exploring here.

> ...a *Vertical discourse* (technical term)
>   takes the form of (=)
> a coherent, explicit and systematically principled structure, hierarchically organised as in the sciences, or it takes the form of a series of specialised

languages with specialised modes of **interrogation** and specialised criteria for the **production** and **circulation** of texts as in the social sciences and humanities. (definition)

A *Horizontal discourse* (technical term)
      entails (=)
a set of **strategies** which are local, segmentally organised, context specific and dependent, for maximising **encounters** with persons and habitats. (definition)

And for explanation, as we have seen for history discourse, grammatical metaphor is the resource which enables 'cause in the clause' realisations of cause and effect relations. A full range of these is deployed in text 8 below, which complements the scientific explanation of warm fronts in text 3 above (setting up a taxonomic opposition between cold and warm frons as it does so):

[8] **Cold fronts.** A stream of comparatively cold, dense air tends to move along close to the ground as it flows towards regions in which warmer, less dense, air is rising. This rising air becomes cooler for the **reasons** mentioned earlier, and <u>if</u> it is humid condensation of water vapour will take place. The **resulting** clouds are usually of the cumulous type. The front edge of the cold air mass is known as a **cold front**. Much of the rain that falls in Australia occurs **as a result of** cold front conditions.

Fig. 7.7 shows how a cold front **causes** uplift and condensation in a warmer, humid, air mass.

The arrival of a cold front **is marked** by a sharp drop in temperature and a sudden change of the wind direction. [Messel 7.6]

The contingent implications are mapped out through causal relations realised by a noun (*reasons*), a conjunction (*if*), a verbal modifier (*resulting*), a preposition (*as a result of*) and two verbs (*causes*, *is marked*) - and only one of these, *if*, functions between clauses.

For its part social science explains in comparable terms. Bernstein for example explains distributive rules as follows:

[9] Consider a situation where a small holder meets another and complains that what he/she had done every year with great success, this year failed completely. The other says that when this happened he/she finds that this 'works'. He/she then outlines the successful strategy. Now any restriction to circulation and exchange reduces effectiveness. Any restriction specialises, classifies and privatises knowledge. Stratification procedures produce distributive rules which control the flow of procedures from *reservoir* to

> *repertoire*. This both Vertical and Horizontal discourses are likely to operate with distributive rules which set up positions of defence and challenge. (Bernstein 1996/2000: 158).

As for historians, there is more than one kind of cause - which in text 9 he verbalises as *reduces, specialises, classifies, privatises, produce, control* and *set up*.

Now any **restriction** to **circulation** and **exchange** (**Agent**)
reduces
effectiveness (**Medium**)

Any **restriction** (**Agent**)
specialises, classifies and privatises
knowledge (**Medium**)

Stratification procedures (**Agent**)
produce
distributive rules… (**Medium**)

distributive rules which (**Agent**)
control
the **flow** of **procedures** from *reservoir* to *repertoire* (**Medium**)

…**distributive** rules which (**Agent**)
set up
positions of **defence** and **challenge** (**Medium**)

As far as Muller's conception of verticality is concerned, the main insight SFL has to offer has to do with the distilling impact of technicality in relation to grammatical metaphor. In effect what happens is that definitions kill off grammatical metaphor by generating technical things. We've seen several examples of this in relation to scientific and social scientific concepts such as clouds, warm fronts, colds fronts, vertical discourse, horizontal discourse, hierarchical knowledge structure, horizontal knowledge structure, verticality and grammaticality. Once established, these terms can be assembled into taxonomies (e.g. warm/cold fronts, vertical/horizontal discourses and then within vertical discourses, hierarchical/horizontal knowledge structures, featuring verticality and grammaticality). Without the distillation, such classification would be a cumbersome process indeed - one which would be unlikely to transcend residence in a specific text (cf. Ruddock's instantial taxonomy in text 3 above) and not one which would

facilitate verticality by lightening up the discourse so that it can move on.

And part of moving on of course involves deploying technical terms in explanations. Bernstein used several technicalisations in text 9 above, in causal relation to one another: *stratification procedures, distributive rules, reservoir, repertoire, vertical and horizontal discourses, distributive rules*. Technical distillation means that 'cause in the clause' can relate large scale condensations of meaning to one another; and this makes it easier for the discourse to develop ever more general and integrative propositions.

In short then we are suggesting from an SFL perspective that the evolution of vertical discourse in any culture depends on grammatical metaphor, and that the degree of verticality a knowledge structure exhibits correlates strongly with its technicality.

5. SFL as a knowledge structure

We are now in a position to consider from a sociology of knowledge perspective what kind of knowledge structure SFL enacts. As suggested above, is looks to be a prototypical warring triangle - as predicted by Wignell for segments in social science knowledge structures. In saying this we are emphasising that it is just one segment in a horizontal knowledge structure (i.e. the discipline of linguistics), since it is unable to subsume rival theories. And we are highlighting the fact that SFL exhibits more of Muller's verticality and grammaticality than comparable segments in the humanities, as reflected in its high level of technicality and its concern with relating its propositions to varied instances of language use.

As far as verticality is concerned, SFL deploys a number of hierarchies which resonate with Bernstein and Muller's notion of ever more integrative propositions. Martin & Rose 2007 for example set up an abstract level of genre coordinating combinations of ideational, interpersonal and textual meaning at the more concrete levels of register and language (see Fig. 8 below).
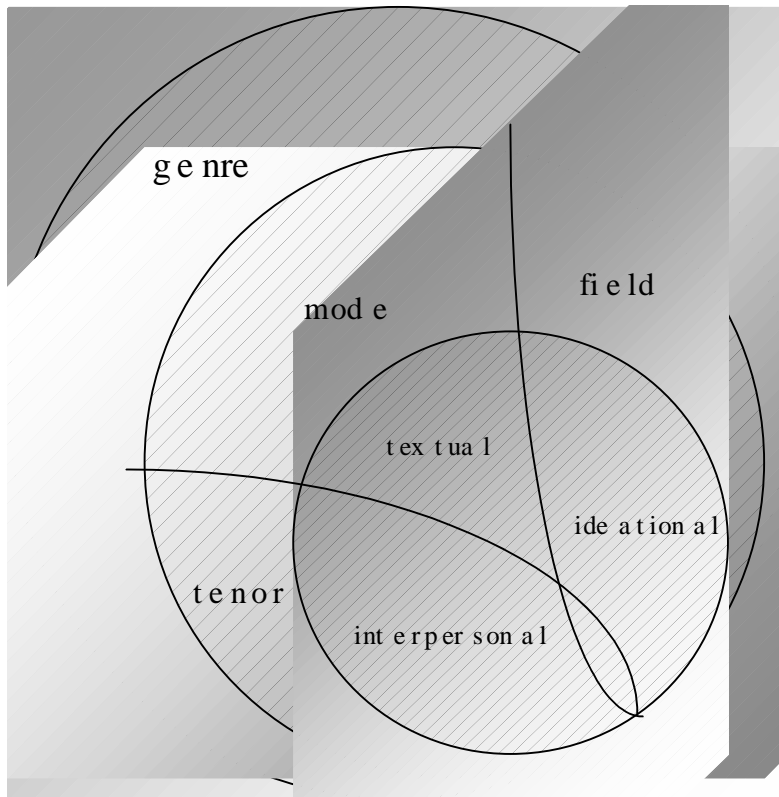
Fig. 8: Genre as a Generalisation of Register Variation

And at the level of genre relations among conventionalised text types are modelled in system networks, with the more integrative generalising features to the left and subclasses to the right:
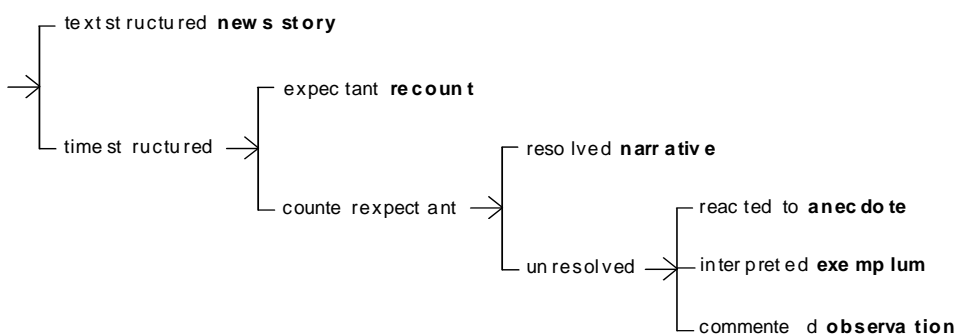

Fig. 9: Classification of Story Genres

As Figures 8 and 9 indicate, however, SFL makes use of more than one hierarchy (i.e. a realisation hierarchy in Fig. 8 and a classification hierarchy in Fig. 9). And such complementary hierarchies[ii] reflect the multi-nocular perspective on linguistic phenomena adopted by SFL. Beyond this there is a range of linguistic patterns which SFL models not as hierarchies but as complementarities - the ideational, interpersonal and textual meaning modelled as simultaneous wedges[iii] in Fig. 8 for example. In physics, the well known complementarity of light as wave and light as particle illustrates the modelling issue here - at times, for certain phenomena, integration under a single generalising proposition is not possible. For a full explanation, we have to theorise a dual or trial perspective. This suggests that verticality needs to be interpreted as accommodating complementarity alongside apical integration, to allow for the complementarities just reviewed, and in the case of SFL to allow for for complementary hierarchies.
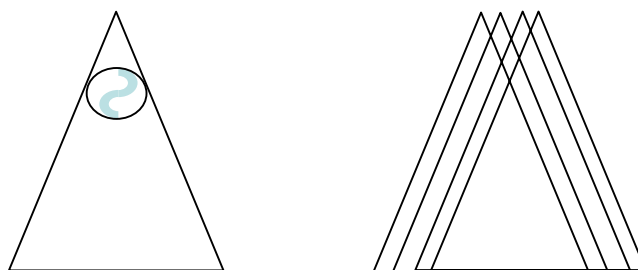

Fig. 10: Complementarity within and between Hierarchies

As far as technicality is concerned, SFL (and linguistics in general) positions itself among the more technical of the social science disciplines. The metaphor distilling power of technicality is recursively deployed so that defining a category such as English Subject, for example, may itself involve several technical terms:

> The *Subject* is the interpersonal clause function which changes sequence with the Finite to change MOOD between declarative and interrogative and is referred to by an anaphoric pronoun in mood tags.

We can contrast this with the relative lack of recursive technicality in Bernstein's definitions, which tend to pack a number of grammatical

metaphors into a single term but less commonly re-deploy this technicality in the definition of further concepts.

> A **Horizontal discourse** entails a set of strategies which are local, segmentally organised, context specific and dependent, for maximising encounters with persons and habitats....This form has a group of well-known features: it is likely to be oral, local, context dependent and specific, tacit, multi-layered and contradictory across but not within contexts. [Bernstein 2000:157]

Muller's grammaticality is a divisive issue amongst linguistic theories, since linguists are deeply divided over whether their data is constituted by instances of language in use on the one hand or intuitions about the well-formedness of structures on the other. SFL takes language is use as data and so devotes a great deal of modelling to the problem of connecting theory, description and documented instances of language use with one another. Alongside realisation (degrees of abstraction from phonic substance) and delicacy (subclassification), illustrated in Figures 8 and 9 above), instantiation and individuation hierarchies are also deployed. Instantiation relates climate to weather along a scale concerned with the specification of meaning potential. Individuation relates the reservoir of meanings in a culture to individual repertoires, along a scale concerned with coding orientation. In a model of this kind, all levels of abstraction (language, register and genre) instantiate - the system to text relation; and all levels of abstraction also individuate - the reservoir to repertoire relation. While this might seem from the outside as a rather over-determined implementation of Muller's grammaticality, from the perspective of SFL it is simply arguing that in order to make linguistic data bear on theory we have to consider how far we are from the noises coming out of people's mouths (realisation), how many instances we are generalising across (instantiation) and just who and how many people are speaking (individuation).
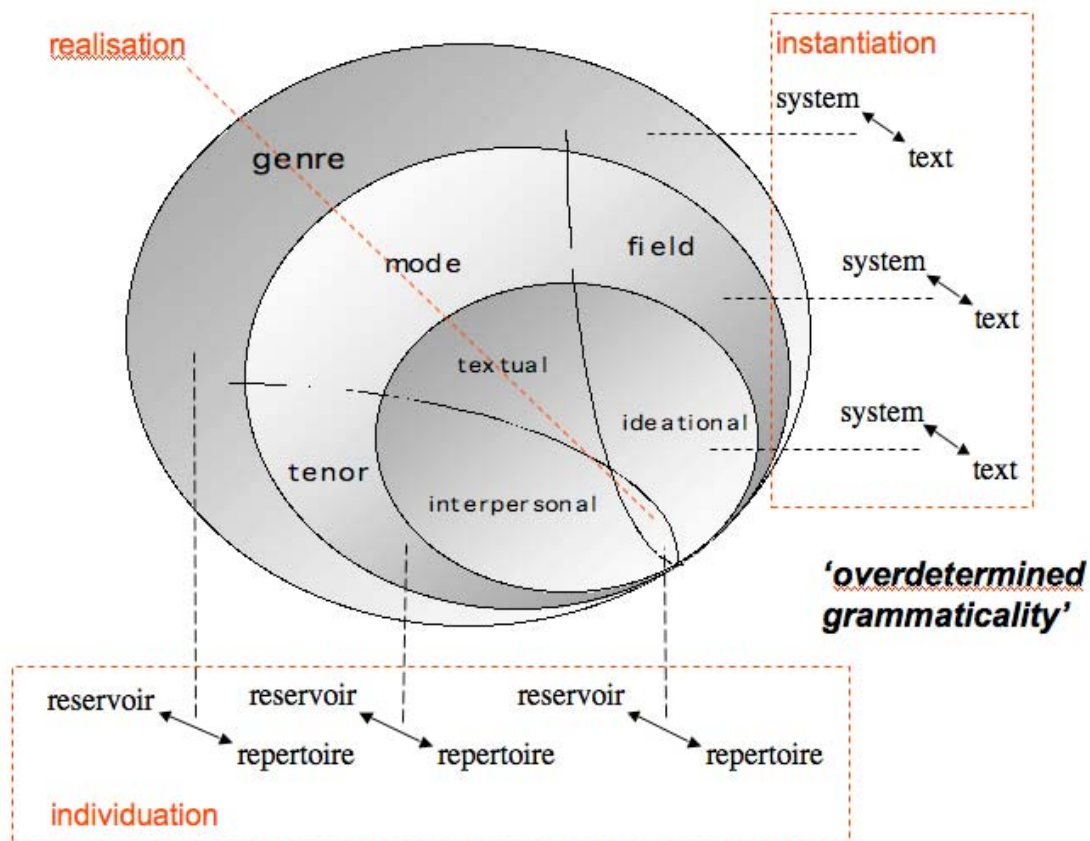
Fig. 11: Overdetermined Grammaticality in SFL

6. SFL as a meta-language

Martin (1999, 2007) interprets the genre-based literacy programs of the 'Sydney School' in relation to Bernstein's notion of pedagogic discourse (1996). Since these programs deploy explicit knowledge about language and related modalities of communication in their pedagogy, they involve a doubling of instructional discourse - with a social semiotic instructional discourse (SSID) projecting the instructional discourse (ID) of the various subject areas. Metadiscourse in other words can be read as projecting instructional discourse, with both of these discourse in turn projected by regulatory discourse (RD); Christie 2002 discusses the

notion of projection used here, referred to as embedding by Bernstein (e.g. 1996).

This raises the question of what kind of recontextualisation process is involved when SFL models the discourse of a discipline by way of enabling its pedagogy and curriculum planning. History, sociology and science have been subjected to this kind of metadiscursive analysis in various sections of this paper. Let's pursue the case of history here, in this instance by factoring it as a system of genres (Coffin 1997, 2000, 2006; Martin 2002a, 2003, Martin & Rose 2006). Work on secondary school history is outlined in Fig. 12, which deals with a range of chronologically unfolding (recounts and accounts), explanatory (explanations) and argument genres - arranged with those closer to common sense at the top of the diagram and those further away below.

biographical → first person → **autobiographical recount** — **common sense**

biographical → third person → **biographical recount**

temporal → historical **historical recount**

field time → temporal

causal **historical account**

explain → inputs **factorial explanation**

explain → outcomes **consequential explanation**

text time → explain / argue

argue → one-sided → promote **exposition**

argue → one-sided → rebut **challenge**

argue → multi-sided **discussion** — **uncommon sense**
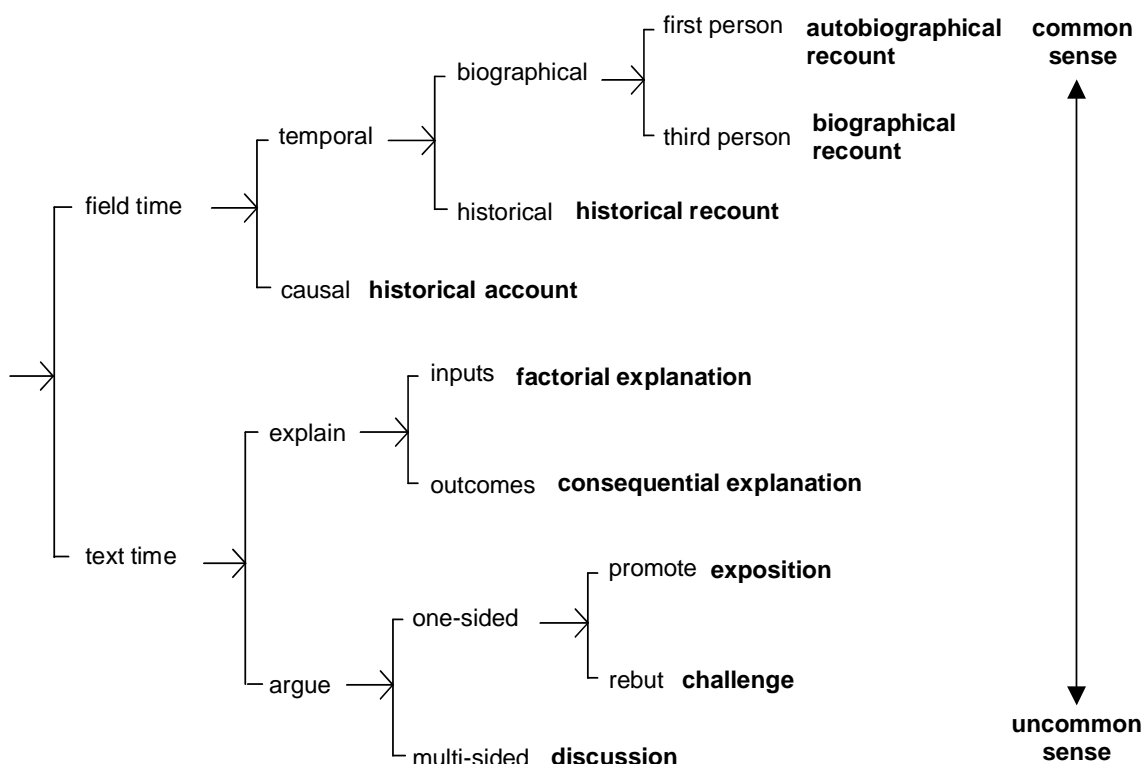
Fig. 12: Secondary School History as a System of Genres

This mainly typological perspective can be complemented in SFL with a more topological one which uses vectors to establish a semantic region in which genres can be related as more or less alike one another. This kind of modelling in outlined in Fig. 13 for the recount genres, using the difference between serial time ('and then') and episodic time ('in another time') as one vector and the contrast between individual participants and generic classes of participant as another.

serial time

personal
recount

individual
participants

generic
participants

autobiography

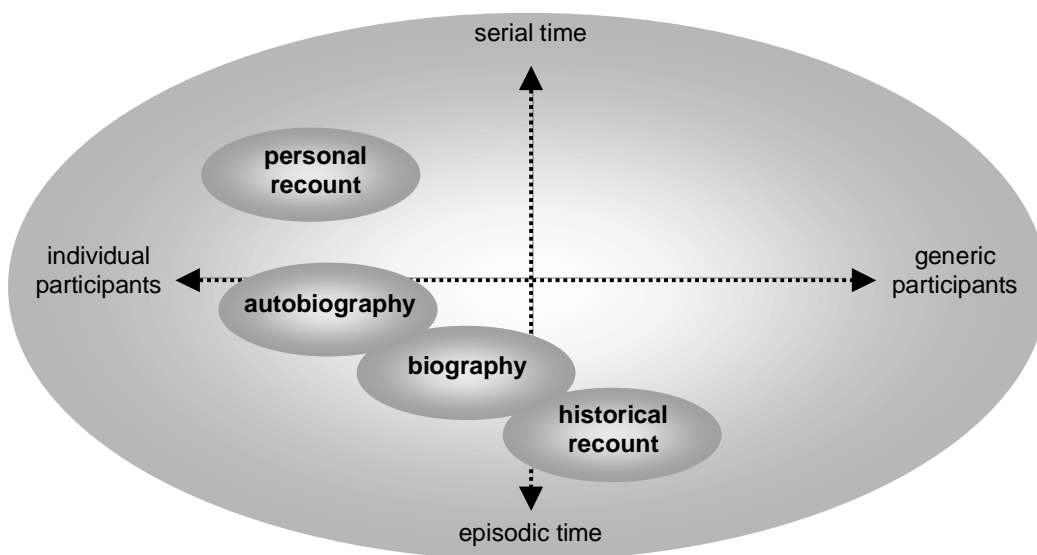biography

historical
recount

episodic time

Fig. 13: A Topological Perspective on the Recount Genres

Topology is a useful tool for evaluation, when teachers need to reason about how close an approximation a student's text is to an ideal type in the field. Topology also makes it easier to build genesis into the picture and reason about effective learner pathways for apprenticeship into a discipline. One such pathway is outlined in Fig. 13, which attempts to optimise a series of steps taking students from the spoken genres they bring to school through the written genres they need for assessment and public examination purposes.

In Muller's terms it would probably be fair to say here that this kind of analysis verticalises the discipline. It also grammaticalises history, although we will not have time to develop this point here - since each genre is conceived as a configuration of meanings (at the levels of register, discourse semantics, lexicogrammar and phonology/graphology) related to recurrent instances of language use (cf. the discussion of time and cause in history discourse in section 3 above). The experience of the Sydney school is that when this kind of deconstruction of a discipline is shared by teachers and students then

access to the discourses of the discipline can be far more widely distributed.

multi-sided

exposition through discussion

one sided

internal cause

explanation to argument

external cause

rhetoric

account to explanation

chronology

cause

recount to account

time

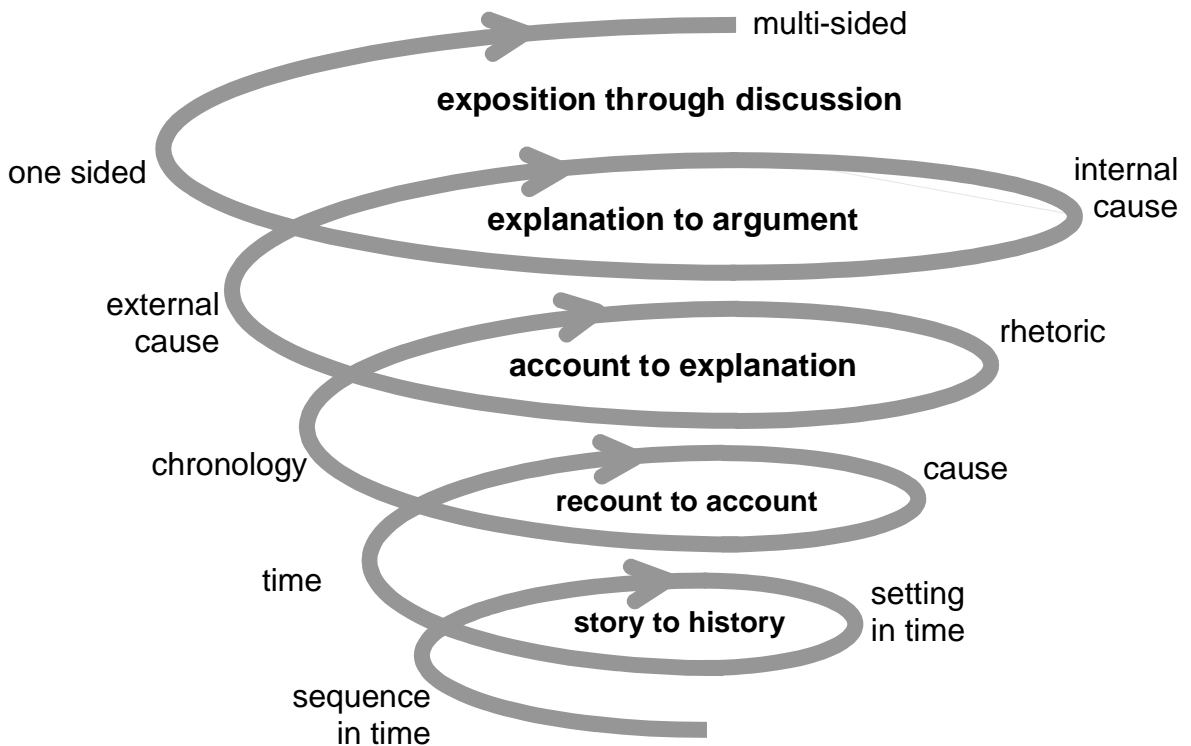setting in time

story to history

sequence in time

Fig. 14: A Learner Pathway for Secondary School History Genres

The price that must be paid for this redistribution of discursive resources is that history teachers have to get comfortable with a knowledge structure from the social sciences which has much more verticality and grammaticality than their own. By the same token, science teachers have to get used to a knowledge structure with less verticality and grammaticality, and allow in effect for a horizontalisation of their knowledge structure since a new language of description (SFL) has entered their discipline. The different contexts for the social semiotic metadiscourse engender different stances of resistance. On the humanities side, teachers worry that creativity and critique are being

sacrificed in the interests of overly schematic and indoctrinating rules. On the science side, teachers worry that crucial content will have to be set aside in order to make room for intruding domains of technicality. My concern here is not to address these anxieties (see Christie 1992, Cope & Kalantzis 1993, Feez 2002, Giblett & O'Carroll 1990, Macken-Horarik 2002, Martin 1991, 1993c, 1998, 1999b, 2000a, b, 2001 for discussion), but rather to draw attention to their origin - namely the intrusion of a distinctive social semiotic instructional discourse into the pedagogic discourse of a foreign knowledge structure.

7. Envoi

In this paper I have presented a brief synopsis of SFL work on field, contrasting science and history with respect to both activity sequence and taxonomy. Bernstein and Muller's complementary sociological tradition of research was then introduced, and key relations to SFL research reviewed. In particular the relation of grammatical metaphor to vertical discourse, of technicality to verticality and of hierarchies and complementarities to grammaticality was highlighted. These and further dimensions of this dialogue are developed in Christie and Martin 2007.

Bernstein and Muller's conception of knowledge structure was in addition deployed to reflect on the nature of SFL itself as a type of vertical discourse, including discussion of one challenge it presents for current definitions of hierarchical discourse - namely its multi-nocular vision in relation to its various complementarities (such as metafunction) and complementary hierarchies (e.g. realisation, instantiation and individuation). The precise nature of Muller's verticality and grammaticality in SFL has important implications wherever SFL is deployed as a metadiscourse for disciplines, since such interventions inevitably involve a recontextualisation of the nature of disciplinary knowledge. This raises crucial issues about democratisation of learning and teacher reactions to SFL interventions, which can perhaps now be pursued with deeper understanding and polemic defusing insight.

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[i] Web address: http://www.bom.gov.au/info/clouds/

[ii] Additional hierarchies include rank (constituency), instantiation (system to instance), individuation (reservoir to repertoire) and genesis (unfolding text, individual development and cultural evolution).

[iii] Additional complementarities include axis (system and structure), perspective (synoptic or dynamic) and modality (language, image, music etc.).