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Title/Titel:	<i>Moral Insight in Jane Austen: A Study of her Development as a Novelist</i>
Medium:	English

Mansfield Park: Cynicism and Moral Thought (Chapters 1-17)

In a letter dated 29 January 1813, Jane Austen stated that her new novel, *Mansfield Park*, would be different from *Pride and Prejudice* and 'a complete change of subject'. The new subject was to be 'ordination'.

An examination of *Mansfield Park* reveals that in phase after phase of the plot Jane Austen is dramatizing a particular kind of difference between right and wrong judgment. A variety of topics is offered for judgment: education, gentlemanliness, modesty, an apricot tree, landscape-gardening, a chapel, theatricals, the significance of ordination. The characters who judge rightly are those who are aware of, and understand, the inner nature or 'private character' of what is being discussed, and those who err do so because they judge by irrelevant, incidental, or superficial aspects. Success in judgment is shown to be dependent not so much on intelligence or experience as on a capacity for deep and sincere feeling, an ability to *respond* to things, people, and situations; failure to respond in this way has important moral consequences in behaviour.

London is associated with shallow feeling and a cynical observance of forms; in the Portsmouth episodes we see warmth of feeling, but the feeling is not disciplined or sustained by decorum; at Mansfield Park itself we look for the union of propriety and true feeling, and it is in the rural Thornton Lacey, remote from London but near Mansfield, that Fanny (with Edmund whom she has saved from the influence of Mary and London) will find her appropriate setting and live in a world where values are real and judgment is true.

The themes, scope and manner of *Mansfield Park* derive from various sources, among which are the Scriptures, Crabbe, Bunyan, Cowper's *The Task*, and the play *Lovers' Vows*, all (except the last, which is reflected ironically) having a specifically moral concern.

Jane Austen's Subject (Chapter 18)

Jane Austen addressed herself systematically in *Mansfield Park* to the subject that was to occupy her in all three of the mature novels that were conceived and written at Chawton: the difference between behaviour that is moral and behaviour that is merely polite and, perhaps, disguises a bad motive.

The country gentry provided the right material for her purpose. Whereas in her early novels she had written about the gentry because she knew them best, after *Pride and Prejudice* she wrote about them because in them could be seen most clearly the gulf that divides mere observance of a strict and sophisticated code of conduct from behaviour that is moral because it is an expression of autonomous principle: in *Mansfield Park* it is called 'active principle'. She demonstrates that though a civilized society no doubt requires a comprehensive code of polite conduct, real virtue is attained only rarely, and only by those members of the society who have learnt truly to know and to feel the values that a civilized code attempts to embody. Real virtue is achieved only by individuals who recognize and respond fully to objects, situations, people, and entities.

The Early Novels: Superficial Comedy (Chapters 19-21)

Sense and Sensibility, *Northanger Abbey* and *Pride and Prejudice* were conceived and written — though not as we know them — by 1803, when Jane Austen was twenty-seven. Ten years or more elapsed between their original composition and their publication, and, although Jane Austen revised them more or less thoroughly, they are different from the Chawton novels. They are concerned with moral behaviour in the country gentry, but they do not treat the subject that I have described in Part II with the concentration and penetration that develops in *Mansfield Park*. *Sense and Sensibility* and *Northanger Abbey* touch the subject of *Mansfield Park* only incidentally and superficially, but in *Pride and Prejudice*, which Jane Austen revised extensively after she had started *Mansfield Park*, we are aware of a more explicit concern with the difference between reality and mere appearance; thus this novel presents us with an interesting transition. Jane Austen knew that to treat the new theme adequately she required a new novel: this explains why she expressed dissatisfaction, though very whimsically, in a letter dated 4 February 1813. Her remark (in a letter written six days earlier), that *Mansfield Park* was to be 'a complete change of subject', was accurate and significant.

The Later Novels: Mature Comedy (Chapters 22-23)

In *Emma* and *Persuasion* Jane Austen applies with consummate artistry the concepts and insights that were conscientiously in-

vestigated in *Mansfield Park*. Both novels are concerned with true gentility, or virtue. Emma learns in the end that appearance is often delusive and truth very difficult to arrive at, and that true gentility has less to do with style and forms than with goodwill and humanity: everything becomes clear to her when she is deeply moved and able to see the truth about herself.

Anne Elliot (in *Persuasion*) lacks Emma's sharp and vivacious intellect, but she seems always to have a sensitivity of response, an awareness of 'private character', and thus a true sense of values. The responses of all the others (with the exception, usually, of Wentworth) differ from Anne's in kind or degree. What Anne has to learn is to have confidence in her own judgment, even when it is at variance with that of Lady Russell, who observes the social code strictly but without feeling or real knowledge, and thus illustrates the difference that there can be between decorum and virtue, semblance and truth.

Another Change of Subject? Sanditon (Chapter 24)

In her three last completed novels Jane Austen describes virtue and accounts for moral failure in individuals; of *Sanditon* it is less true to say that she has changed her subject again than that she has begun another phase of the enquiry which she started in *Mansfield Park*. *Sanditon* appears to have been conceived as a satire on a new kind of society, a society characterized by a restlessness and acquisitiveness that make truth and individual virtue still more difficult to realize. The proprietors and patrons of Sanditon are urbanized, commercially-minded and uprooted; they have lost touch with the pieties and moral values that have evolved and are maintained in the world which we catch sight of in Henry Crawford's description of Thornton Lacey in *Mansfield Park*.

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Title/Titel:	<i>The Poetry of William Empson</i>
Medium:	English

The publication of *Seven Types of Ambiguity* in 1930 not only laid the foundation of William Empson's reputation as an original and stimulating critic, but also revealed the principles that were to influence his poetical development. These principles were based on the literary theories of I. A. Richards, his Director of Studies at Cambridge, and supported the argument that poetry is fundamentally a form of communicated meanings, all of which can be analysed and explained. In the critical works that he wrote after *Seven Types of Ambiguity*, Empson extended this critical dogma through the use of sociological material, attempting to show how beliefs and attitudes altered the meanings of words and increased their possible ambiguity. All this is reflected in his verse.

His emphasis on complexity of meaning as a criterion of poetic value led him to choose seventeenth century metaphysical verse, with its predilection for the ambiguous, the recondite, and the bizarre, as his poetic ideal. His decision to imitate Donne and his school is, therefore, in accordance with the principles upon which he formed his critical dogma; at the same time, this decision is an indication of his sensitive feeling for the intellectual tone of his own age. There had been a revival of interest in the poetry of the seventeenth century during the late 'twenties (mainly due, in the opinion of F. R. Leavis, to the influence of T. S. Eliot) and Empson found an appreciative, if rather uncomprehending, audience for his work. He was encouraged in his deliberate complexity by the similarity between his own theory of ambiguity and T. S. Eliot's belief that a modern poet must be difficult, must 'dislocate if necessary, language into his meaning'. Apart from the similarity in critical dogma, Eliot's poetical innovations, his use of colloquial idiom, metaphorical compression and 'unpoetical' material produced the necessary re-orientation for Empson to write his particular 'clotted kind of poetry'.

Empson's poems can be divided into two sections: poems written between 1927 and 1933, and those that he wrote after 1933. The earlier poems are characterised by an excessive preoccupation with

intellectuality, a compulsion to probe and dissect feeling and thought, and seem to have been written with the assumption that one can reason oneself into the aesthetic experience.

The underlying thought in Empson's poetry is the paradox that 'life involves maintaining oneself between contradictions that can't be solved by analysis'. He expresses this in the early poems through the idea of a conflict, either between the individual and his own self-consciousness, or between the individual and society. In both cases, this conflict is accompanied by a sense of isolation which increases the resultant mental and spiritual torment. There is an ingenious use of entomic images in poems such as *The Ants*, *Value is in Activity*, *Plenum and Vacuum* and *High Dive* to illustrate the neurosis that this situation produces; in *Arachne* and *Sea Voyage*, he uses the "persona" of a spider to suggest that we can adapt ourselves to the situation through a careful balancing of opposing tensions, much as the spider constructs his web.

Like Donne, Empson draws upon the sciences for many of his metaphors; the sense of constriction that he perceived in the social consciousness led him to describe the individual's attempts to escape from this constriction through the use of cosmological comparisons. There is a successful use of this scientific material in *The World's End*, where 'curved' space is used to show that we are confined within an inescapable system of beliefs that, paradoxically, defeat their own ends. Empson is less successful when he combines cosmology and entomology in his images to illustrate his theories on existence; the two fields of reference remain parallel examples in the poetic argument, they are not drawn together in a final, illuminating image.

The tendency in the earlier poems was to sacrifice feeling for thought; the logical extension of ideas became an end in itself, forcing the ultimate meaning further and further away from the reader until it was finally lost in a maze of ingenious paradoxes, analogies, and contrasts. Yet despite the degree of syntactical and intellectual compression, the fundamentals of good poetry existed behind this façade of a 'sophisticated' obscurity. Profundity of thought, imaginative expression, metrical skill, and above all a sensitive feeling for the way in which language works, all revealed Empson's potentiality. This potentiality was fulfilled in the poems that he wrote after *Bacchus*, when he came closer to that passionate ratiocination which gives the poet his superiority over the purely analytical thinker.

In Empson's poetry, there is a definite progression in sensibility. The earlier poems express a desire to remain aloof from the human situation, but after *Bacchus*, there is a growing sympathy with the difficulties of those engaged in 'the public spirits or the private play' (*Success*). Many of the later poems, particularly *Autumn on Nan-Yueh*, reveal a sense of responsibility, a concern for the moral welfare of society that extends beyond the witty display of 'ambiguous gifts'.

Empson's verse is both a confirmation of the new bearings taken in English poetry since 1910 and an indication of future development. Although he finally reduced the 'close pack't line' to complete obscurity in *Bacchus*, his combination of associated images and a dual syntax in this and other poems has advanced the possibilities of contrived ambiguity as a poetical device. He also differs from his contemporaries in the way he has developed non-traditional imagery, Whereas they were content to introduce contemporary material into their verse to give it 'atmosphere', or as a sign of liberal tendencies, Empson was able to use a concept from modern science that was inseparable from the development of meaning in the poem; his images are functional, not ornamental, and are intended to reveal something of the limitations of life and to suggest a means to overcome them. His deliberate cultivation of an analytical self-consciousness from which to derive his ideas, images, and philosophies seems to presage a type of poetry in which auto-psychology will be the motivating force.

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Title/Titel:	<i>A Revaluation of John Dryden as Dramatist</i>
Medium:	English

John Dryden is one of England's best-known poets. That he also wrote some twenty-six works for the stage and was the most popular playwright of his time has often been forgotten or glossed over. Most critics, among them Saintsbury, treat the plays condescendingly as if they are forgivable eccentricities. T. S. Eliot broke away from this tradition and was the first to criticise Dryden's plays objectively. Of all the plays he thinks that only *All for Love* is truly 'great', but that it suffers from the inevitable comparison with Shakespeare's *Antony and Cleopatra*. Eliot contends that 'Heroic' drama, so successful in France, does not suit the English temperament or form part of its literary tradition.

Close examination reveals that Dryden's plays are not deserving of the belittlement which critics usually mete out to them. Not only is *All for Love* a great play, but at least two others, *Aureng-Zebe* and *Don Sebastian*, have more than ordinary merit; indeed, they often have sections which are memorable.

Many of the plays written before 1675 seem to have been churned out to satisfy the 'gross' taste of the Restoration public. They are grandiose plays with complicated plots, highly romantic settings and exaggeratedly noble sentiments. These early plays deal with the themes which were to preoccupy Dryden until his death, namely, the relationship between 'Love', 'Honour' and 'Reason'. In the comedies (although they are crudely constructed and unnecessarily bawdy) he makes acute criticisms of Society and dissects behaviour in a mode inadequately labelled 'The Comedy of Manners'. Of the early plays the bombastic *The Indian Emperor* is certainly the best.

By 1669 Dryden had learned more of his craft, and his opinions on the exercise of Reason, which he regarded as Man's most distinctive ability, had been clearly formulated. *Tyrannic Love* has much in it that is fine; its firmer construction and more natural

diction owe much to Dryden's serious contemplation of Drama, his *Essay of Dramatic Poesy*. The plot of *Tyrannic Love*, although it is bloody and complicated, is coherent; the events are so ordered that the hero's progress to his doom is inevitable. Dryden discusses the use of Reason: like the Elizabethans, he believes its absence means insanity and chaos. Maximin's increasing refusal to criticise his motives and actions results in his eventually becoming completely mad. The play is written mainly in rhymed couplets, obeying the dictum Dryden had defended in his *Essay*. Although much of the dialogue is stilted and unnatural, Dryden succeeds in delineating consistent and probable character.

Tyrannic Love was followed by the two parts of *The Conquest of Granada* and by *Aureng-Zebe*. These are rhymed plays in the 'Heroic' style and their plots are so complicated that they are difficult to follow. There are, however, many beautiful passages in them, such as Almanzor's gentle and courteous rejection of Lyncaraxa's all-too-sudden propositioning (*The Conquest of Granada*, Part Two: Act III, scene iii).

Dryden's great veneration of Shakespeare did not prevent him from disapproving of his predecessor for not adhering rigidly to the Three Unities. On several occasions Dryden felt moved to 'correct' Shakespeare's plays. The best of these adaptations, and undoubtedly the play which is Dryden's finest, is *All for Love*. The play deals with events in the lives of Antony and Cleopatra after the Battle of Actium. Dryden still manages, in so short a space, to suggest Antony's greatness, and to convey the fascination of Cleopatra; but the world they 'lose' has not the all-encompassing sweep of *Antony and Cleopatra*. It is, nevertheless, a play that has as much merit at least as any of those by Dryden's academically more 'respected' contemporaries, such as Vanbrugh and Otway.

In the last year of his life Dryden wrote two more fine plays. *The Spanish Friar* and *Don Sebastian* are tightly constructed and deeply moving. If their rhetoric, 'grandly' conceived, is too overwrought, for the greater part these two plays have convincing characterisation and contain on occasion much fine blank verse.

Dryden wrote many tragi-comedies. These contain much that is farcical and crude. Tragi-comedy in the hands of Shakespeare, for example, in *The Winter's Tale*, can be wonderfully successful. Dryden's serious plots are laboured and the portentous sentiments of his 'noble' characters are curiously flat in comparison with the vitality and wit of the comic exchanges.

Of the tragi-comedies *Marriage-à-la-Mode* is the best-known and the most successful, mainly because the tragic plot is so slight and the comic parts so very lively.

Amphytrion, based on Plautus's play, is, in my opinion, Dryden's best comedy. Popular in its day, it is now almost entirely forgotten. Although it contains much social satire and comment on mankind's

folly, the comedy and wit is generally 'fantastic': gods assume human shape, light-heartedly beget heroes upon mortals and disport themselves altogether quite ridiculously if immorally.

As poet-dramatist Dryden is justifiably not accorded the same status he has as a critic and a poet. His best plays, however, deserve to be read and acted; they do not deserve to be left to moulder on the back-shelves of some antiquarian library.

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Title/Titel: *A comparative Study of two Examples of River Capture in the Great Escarpment Area of the Eastern Transvaal*
Medium: English

The phenomenon of River Capture or Stream Piracy has hitherto had no systematic treatment in South Africa. Various examples have been noted and dealt with in a superficial way by Davis, Mellor, Hall, King and Wellington from the opening years of this century, but to the writer's knowledge, no detailed investigation of them has been attempted, particularly on a morphometric basis.

It was the aim of this investigation to examine two examples of River Captures in the Eastern Transvaal with a view to establishing the precise nature of the modes of Capture and attempting to date their occurrence in the past. The examples chosen were the captures of the Slang River by the Buffalo in the Volksrust/Charlestown district and that of the M'Thlapitsi River by the Groot Letaba in the Haenertsburg area. The choice was based on the strong contrasts in geological formations, precipitation characteristics and terrain as well as a very obvious difference in age of the phenomena.

Almost the whole of the investigation was done in the field — there can be no substitute for this in geomorphic research. The writer was considerably handicapped by the total lack of even remotely suitable topographic maps of the research areas and by some glaring errors on the existing geological maps, which became apparent during the field investigations. There was no option but to construct the necessary maps from air photographs — themselves of inadequate scale. Further information was added from ground photographs taken at strategic points.

The enquiry involved the reconstruction of the pre-capture conditions of gradient profiles of the beheaded streams from observation of the traces of former courses still in existence. The measurement of these was a very necessary first step in the morphometric analysis of the results of the Captures, for from these former profiles can be calculated the amount of vertical corrasion which has occurred in post-capture times.

Having established the mode of capture in each case — the Buffalo/Slang Capture having been considerably delayed by the nature of the geological formations along the edge of the Great Escarpment, while that of the M'Thlapitsi was materially aided by the rock structures — the writer was able to undertake a calculation of the age of the first example. This was rendered possible by the finely preserved transverse profile of the senile, abandoned valley of the Slang River downstream from the point of capture, which is at present covered by a layer of alluvium some 105 feet in thickness, derived from the flanks of the valley transverse to the area of indeterminate drainage at Vooruitsig Station. This was done graphically and yielded the volume of material which has been deposited in a strip 100 feet wide across the valley. Then, by taking the denudation areas into account, the reduction in altitude of the valley flanks in post-capture times was found and this, when related to Du Toit's measurement of the rate of downwasting of the Vaal-Orange catchment, yielded an age for this Capture of 85,000 years. Further calculations then indicated the rates of vertical and backward corrasion which have operated in post-capture times to produce the gradient profiles of the valleys concerned.

Using the age of the Buffalo/Slang Capture as a constant, the writer was then able to attempt a calculation of the age of the Letaba/M'Thlapitsi example. A number of variables enter this which complicate matters considerably and appear to render precision almost impossible. It has already been stated that precipitation is very different in this area, being, on average, much higher. In addition, the slopes from which the alluvium has been derived in post-capture times are almost four times as steep, of different geological structure and covered by a more vigorous species of natural grass. By combining these factors in an equation incorporating the constant derived from the first age determination, a figure slightly in excess of 4,000 years was obtained for the date of the Capture of the M'Thlapitsi by the Groot Letaba. Further applications of this to vertical and backward corrasion rates yielded not improbable figures for these in view of the nature of the geological formations concerned.

Since this is a Geographical exercise, the writer has not confined attention solely to the geomorphic aspects, but has shown that certain economic possibilities have resulted from the Captures. In the case of the Buffalo/Slang Capture these are potential rather actual at present, and depend for their realisation on the construction of a large dam; those resulting from the second example have been very largely exploited in the development of the Letaba Irrigation Scheme and its stabilising by the construction of the Ebenezer Dam.

The Dissertation makes an original contribution to knowledge of the morphometric analysis of River development in the Eastern Transvaal.

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 Title/Titel: *Die verstedeliking van die Bantoegebiede van Transvaal*
 Medium: Afrikaans.

Tot by sy aanraking met die Blanke beskawing verkeer die Bantoe op 'n neolitiese peil van ontwikkeling, waarskynlik as gevolg van isolasie en gebrek aan prikkeling gedurende sy eeue-oue migrasiegang suidwaarts. Eerste kontakte met die Blanke beskawing dien wel as 'n uitdaging soos te sien is in die aanpassing van die inheemse boukonstruksie by Magor in die Laeveld en elders waar skansdorpe met ystersmedery, wapenvervaardiging en 'n falliese altaar maklik aanleiding kon gee tot die Acropolis of bergvesting as prototipe van 'n nuwe, funksionele verstedeliking. Die poging om homself te handhaaf stuit egter teen 'n oorweldigende Blanke tegnologiese superioriteit en die Bantoe verval in 'n verslae minderwaardigheidsposisie met 'n afvalligheid van eie kultuur en tradisie. Geleidelik word die Blanke lewensmiddele, waaronder klere en voedsel, aanvaar. Boekeleerdheid word 'n simbool van rehabilitasie. Die eerste behoefte is diensneming by Blankes vir lone waarmee die nuwe lewensmiddele en belastings betaal moet word.

Die eerste verstedeliking geskied in die vorm van plakkerskampe van migrasie-arbeiders om die Blanke dorpe wat, veral na die 1913 wetgewing, vinnig toeneem. Hierdie wanordelike en massiewe plakkery word eers na 1952, met die instelling van die Hervestigingsraad en die uitvoering van die voorstelle van die Mentz-kommissie gesistematiseer deur voorsiening van goeie behuising, stedelike dienste en die strenge beheer oor verdere toestroming uit die Gebiede. Die aanvanklike morele verval en verdwyning van die volksanksies word nou verdring deur 'n ernstige begeerte om die Westerse leefwyse, bouvorm, onderwys en die stedelike klimaat te aanvaar.

Die ontstaan en aanwassing van die Bantoe besettingsgebiede in Transvaal, vanaf die vroegste nedersettings tot by die 1913 en die

1936 afbakenings, word nagespoor en 'n beskrywing gegee van die inheemse besettingsvorm, die handel, die nywerheid en die sosiale struktuur. Die Bantoe in die Gebiede kan, weëns ontoereikende ruimtes, uit die landbou alleen geen menswaardige bestaan vind nie en verstedeliking is dringend noodsaaklik. Uit 'n studie van die bevolkingsgetalle en die bodempotensiaal kan die vereiste verstedelikingstempo statisties bepaal word.

Die sosiale en ekonomiese struktuur van die nuwe Bantoege-meenskappe in die dorpe om die Blanke stede word ondersoek en ontleed teneinde rasonale verstedelikingsvorme te vind vir die Gebiede, binne die bestaande politieke raamwerk. Dit is duidelik dat verstedeliking in die Gebiede slegs op Westerse patroon kan geskied en op 'n funksionele en ekonomiese grondslag moet berus. Dorpstigting moet dus eerstens gebaseer wees op die basiese landbou- en mynbou-produksietakke om die grootste aantal lonende werksgeleenthede te skep en tweedens moet dit gemik wees op verskaffing van stedelike dienste aan die breë hinterland. Diversifikasie van die nywerheid en handel sal aanleiding gee tot funksionele ontplooiing en die stedelike kerne 'n dinamiese groeikrag verleen.

Die nuwe Vrystaatse Goudvelde dien as voorbeeld van die enorme verstedelikingspotensiaal van 'n dinamiese groeipunt gebaseer op 'n sterk basiese nywerheid in 'n voorheen onder-ontwikkelde gebied. 'n Statistiese analise van die Witwatersrandse stadswormtoon ook die bedryfsverspreiding, die indiensneming en die bevolkingsverspreidingspatroon wat volg uit die rypwording van so 'n groeipunt. Hierdie simbiotiese struktuur moet deur ekstrapolasie in die Gebiede geskep word.

Wat die vorm van die stad aanbetref het die Westerse argitektuur en planologie reeds internasionale inslag gevind en is dit ook vir die Bantoe die aangewese bouvorm. Die lapamotief word soms nog deur party instansies aangewend sonder dat sy oorspronklike geestelike en funksionele betekenis in 'n vergange milieu verstaan word. Moderne argitektuur en stedebou verskaf meer doeltreffende woonruimtes as die „lapa”, wat vir die stedelike Bantoe eweveel 'n anakronisme is as die hartebeeshuisie vir die Afrikaner.

Die funksionele en dinamiese verstedeliking van die Gebiede sal op regionale grondslag moet berus teneinde 'n behoorlike verband tussen die kern en die hinterland te verseker terwille van die wisselwerking tussen grondstowwe en fabriek en tussen die stedelike dienste en die plattelandse bevolking deur 'n saamgesnoerde kommunikasie- en organisasiepatroon. Maatstawe vir die afbakening van hierdie sosio-ekonomiese ontwikkelingstreke word opgestel om die stedelike groeipunte te kan integreer met die geografiese bevolkingsverspreiding en die beskikbare hulpbronne.

Voorstelle word gemaak vir die konsolidasie van die bestaande Bantoegebiede deur verwydering van „swart kolle” en omruiling van grond. Vyf sulke homogene ontwikkelingstreke word kartografies afgebaken op grondslag van (a) die bevolkingsverspreidingspatroon en die getalleverhoudings tussen die onderskeie rasse; (b) optimale grootte vir ’n selfstandige en gebalanseerde ekonomie; (c) optimale afstande vir lewering van spesialiteitsdienste, waaronder mediese verpleging, handel en finansies en administrasie vanuit die administratiewe hoofstad en (d) die bestaande kommunikasiepatroon en veral die topografiese grense tot die sosiale en ekonomiese samehang, soos byvoorbeeld skerp waterskeidings en onherbergsame terreine.

Aan die hand van ’n voorbeeld, naamlik die Rustenburgse ontwikkelingstreek, word ’n metodologie vir die beplanningsopnames van die bodempotensiaal en van die kulturele hulpbronne aangedui. Die prosedure vir rasionalisasie en opstel van ’n gesonde ontwikkelingspatroon word aangedui, insluitende die daarstelling van die stedelike groeipunte en ’n doeltreffende kommunikasiepatroon.

In die uitvoering van die plan sal ’n liggaam soos die Bantoebeleggingskorporasie, aanvanklik met Blanke kapitaal en -tegniek, ’n belangrike rol moet speel, maar dit word in die vooruitsig gestel dat die kapitaal — deur administratiewe reëling — deur die Bantoe geïlkwyder sal word soos hulle mettertyd kapitaalkragtig word. Die ontwikkelingsmodel beoog ook die optimisering van die beleggings om die grootste indiensneming — aanvanklik van ongeskoolde arbeid — te bewerkstellig en gevolglik die vinnigste moontlike tempo van verstedeliking te bereik.

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Title/Titel:	<i>Die Geskiedenis van die Nederduitse Gereformeerde Gemeente Colesberg, 1825-1875</i>
Medium:	Afrikaans

Met hierdie verhandeling het ons probeer ingaan op die stigting, ontwikkeling en probleme van een van die ou grensgemeentes van die Kaapkolonie, Colesberg, gedurende die eerste 50 jaar van sy bestaan. Verskeie faktore en gebeurtenisse het gedurende hierdie tydperk 'n diepgaande invloed op die gemeente gehad.

Op versoek van die mense in die omgewing van die Torenberg, in die distrik Graaff-Reinet, het Lord Charles Somerset in 1825 sy toestemming tot die stigting van 'n nuwe gemeente verleen. So is dan op die plek waar Erasmus Smit vroeër sy bekende sendingstasie onder die Boesmans gehad het die gemeente Torenberg (in 1830 verander tot Colesberg) van Graaff-Reinet afgestig. In 1830, na die ontvangs van die eiendomsbewyse en 'n skenking aan die gemeente van 18,138 morg grond, wat deur die kerkraad beheer sou word, is ook 'n nuwe dorp aangelê.

Ten spyte van die periodieke besoeke en die bediening van die Woord en sakramente deur die godvrugtige ds. Andrew Murray van Graaff-Reinet, moes die nuwe gemeente gedurende die eerste elf jaar van sy bestaan die bediening van 'n eie permanente leraar ontbeer. Dit het ongetwyfeld die geestelike lewe van die gemeente benadeel, soos o.a. die handel oor „kerknaweke”, selfs met drank tot op Sondae en die smokkelhandel in drank en ammunisie met die Basters, Griekwas en Koranas getuig.

Reeds voor die stigting van die gemeente en ook nog in die jare na die koms van ds. Reid, die eerste permanente leraar, in 1836, vind a.g.v. droogtes, sprinkane en trekbokke die periodieke trekke van die boere vanuit die Noordoostelike grensveldkornetskappe oor die Oranje plaas om weiveld vir hul vee te soek. Hierdie gedurige afwesigheid van 'n groot aantal lidmate het 'n belangrike uitwerking op die kerkbywoning en gemeentelike bedrywighede gehad. Baie van hierdie boere, waarvan die meeste uit die Colesbergse distrik afkomstig was, het hulle ook mettertyd permanent in Trans-Oranje gaan vestig.

Terwyl hierdie trekkery en natuurlike uitbreiding oor die noord-grens op spontane manier aan die gang was, vind gedurende die middel van die dertiger jare a.g.v. politieke e.a. oorsake die Groot Trek, 'n georganiseerde emigrasiebeweging onder leiers, plaas. Alhoewel min mense vanuit Colesberg aan die Groot Trek deelgeneem het, het die trek ook die Colesbergse gemeente indirek geraak. Net soos in die geval van die lojale trekkers wat hulle mettertyd oorkant die Oranje gevestig het of rondgeswerf het op soek na beter weiveld, was Colesberg, as grensgemeente, ook vir die Voortrekkers 'n belangrike skakel met die Kolonie waarheen hulle van tyd tot tyd gekom het om o.a. kerklike voorregte te geniet.

Die Kaapse Kerk wat toe nog in 'n groot mate onder staats-oorheersing gestaan het, het hom aanvanklik doelbewus aan die kant van die owerheid, wat die Groot Trek nie goedgekeur het nie, geskaar. Dié houding van die Kerk vind ons ook duidelik weerspieël in die standpunt van die ring van Graaff-Reinet toe die Colesbergse kerkraad die geldigheid van die uitgewekenes se lidmaatskapsregte ter sprake gebring het en toe ds. Reid, wat hom die lot van die uitgewekenes aangetrek het, hulle herderlik wou gaan besoek.

Ons het gevind dat die stigting en vroeë bestaan van die Colesbergse gemeente in 'n tydperk geval het toe daar 'n belangrike ontwikkeling van die algemene kerkorganisasie en -bestuur plaasgevind het, veral ook wat die vrywording van die kerk van staatsoorheersing en die ontstaan van 'n sinodale- en ringsverband tussen die verskillende gemeentes betref.

As gevolg van die konserwatisme van die mense in die Noorde-like en Noordoostelike distrikte weier baie om die gesange wat in die N.G. Kerk ingevoer is en wat hulle as teenstrydig met Gods Woord beskou, te sing. In Colesberg is die anti-gesangegees a.g.v. die herderlike brief van die ring van Graaff-Reinet (1841) en ds. Reid se optrede deur die gesange op die mense af te dwing sodanig aangewakker dat dit daar voor die afskeiding tot 'n jarelange ongere en bittere stryd gelei het.

Reid se optrede, sy gemis aan takt, sy hardkoppige en eiemagtige houding gee ook aanleiding tot verdere ongelukkige gebeurtenisse en verskeie klagtes teen hom sodat sy verwydering mettertyd die groot strewe van die beswaardes in Colesberg word. Alhoewel die Colesbergse kwessie telkemale na die ring en sinode verwys is, wat sekere oplossings aan die hand gedoen het, het hulle in gebreke gebly om 'n finale oplossing te vind. Met Reid se bedanking in 1854 het die beswaardes wel hulle doel bereik, maar die gemoedere wat tot die uiterste toe verbitterd was, kon nie weer tot bedaring kom nie.

Tydens dr. Servaas Hofmeyr (ds. Reid se opvolger) se bediening in Colesberg het die afskeidingsbeweging begin vorm aanneem en vind in 1859, na die koms van ds. Postma, die stigting van die Gereformeerde (Dopper) Kerk in die Z.A.R. plaas. Daarvandaan brei die afskeidingsbeweging ook na die Vrystaat en die Kaapkolonie uit en in 1860, net na dr. Hofmeyr se vertrek van Colesberg, word

daar op versoek van 'n aantal gemeentede deur ds. Postma een van die eerste Gereformeerde gemeentes in die Kaapkolonie gestig.

Toe ds. Lückhoff in 1861 as jong leraar na Colesberg kom, brand die vuur van afskeiding nog hewig en 'n bitsige stryd en polemiek vind tussen lidmate van die twee gemeentes plaas. Alhoewel ds. Lückhoff sterk optree en probeer verhoed dat meer van sy lidmate deur Postma en die Doppers oorgehaal word en selfs Postma tot 'n openbare samespreking uitdaag, tree hy tog baie verstandig en toegewend op teenoor nie-gesangesingers wat in die N.G. Kerk gebly het en dwing niemand om die gesange te sing nie.

In teenstelling met ds. Reid, was di. Hofmeyr en Lückhoff baie gewild in die Colesbergse gemeente. Hulle arbeid was baie geseënd en hulle het inderdaad veel bygedra tot die geestelike vooruitgang van die gemeente. Tydens hulle bediening daar het beide leraars in die kerklike lewe van hulle tyd 'n belangrike rol gespeel en vir die kerk in die algemeen veel beteken.

Teen die einde van ds. Lückhoff se bediening en met die afsluiting van ons tydperk onder bespreking was die stryd aan beide kante uitgewoed en is die bestaan van twee Hollandse kerke naas mekaar in Colesberg as 'n voldonge feit aanvaar. Na die eerste vyftig jaar van probleme en worsteling volg daar dus in 1875 'n tydperk van rus en kalmte in die N.G. gemeente.

Tydens ds. Lückhoff se dienstyd is, nadat die eerste kerkgebou (in 1832 opgerig) reeds in 'n vervalde toestand verkeer het, ook die nuwe sierlike kerkgebou, wat vandag nog in Colesberg te sien is, opgerig. Alhoewel die oprigting daarvan ook met veel vertraging weens geldelike en ander probleme gepaard gegaan het, was dit na die inwyding in 1866 waarlik 'n sieraad vir die Colesbergse gemeente en inderdaad 'n monument vir 'n nuwe bedeling in sy geskiedenis.

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Medium:	English

Chapter I begins with an Introduction wherein the term "proselyte" is explained. The Chapter then proceeds to consider the position of the proselyte as regards the observance of the precepts of Judaism, the reading of prayers and benedictions.

In the second Chapter the position of the proselyte is discussed with reference to his relatives, to marriage, to transgressions from the pre-conversion period, and ritual cleanness.

In Chapter 3 a discussion of the laws that are incumbent on the Jew with regard to the proselyte; the legal position in case of a proselyte's death with no heirs and of proselytes born in sanctity is described. There follows a consideration of the laws connected with the assumption of proselytism and the proselyte who returns to his former practices.

Chapter 4 digresses from the main theme, that of the Righteous Proselyte, in order to outline the position of the Resident Alien. He is defined and the various aspects of his position considered i.e. his place of settlement, his relationship to the community of Israel, where he is equated to the non-Jew and where he stands legally as regards the observance of the Sabbath. The Chapter then proceeds to deal with idolatry and the wine of the Resident Alien.

In Chapter 5 we return to the main line of enquiry i.e. that concerning the Righteous Proselyte. Here is considered how he is accepted, his entry into the Covenant, his appearance before *Beth Din*, the Benedictions relative to the ceremony of acceptance and the right time for conversion. The Chapter concludes with a discussion of the position of the minor proselyte.

Chapter 6 is devoted to the position of the female proselyte. Here are dealt with her invalidity as regards marriage with the priesthood, her marriage-contract, the law with reference to a fine for rape or seduction, as regards adultery, the distinguishing period and ritual impurity.

Chapter 7 is devoted to a study of the position of the proselyte as it is reflected in the work of Maimonides, the *Mishneh Torah*.

Chapter 8 describes a treatment of the position of the proselyte as it is summarised in the work of Joseph Caro — the “Shulchan Aruch”.

Chapter 9 analyses the small Tractate devoted to the laws of the proselyte entitled *Tractate “Gerim”* (i.e. “Proselytes”).

Chapter 10 considers the position of the proselyte, not as in the legal sources (*Halakhah*), but as it is to be found in the *Aggadah* i.e. the story and parable sections of the Talmud. It is evident therefrom that there exists a divergence of opinion with reference to proselytes.

In Chapter 11 the historical background of proselytism is examined. The works of some historians is being analysed on topics such as “Naaman, the Babylonian Exile, the Return, Ezra and Nehemiah, the Essenes, Shammai and Hillel, Tiberius, the Spread of the Jewish Teaching, Shemaya and Abtalion, the Mishnah, the Christian Missionaries, Matthew 23:15, Rome, Aquila, Domitian, Nerva, Jewish Babylon, Constantine, Constantius”.

Certain conclusions are drawn from this historical survey e.g. that conversionist activities were subject to various influences at different periods of history and that these were the cause of changing attitudes.

Chapter 12 surveys conclusions that emerge from the material that has been adduced hitherto. The writer puts forward what he considers to be the correct assessment of the position and status of the proselyte in Jewish Law. He examines such doctrines as “Jewish Universalism”, “Jewish Particularism” and “Noahism” and finally weighs up the various factors from which emerge a picture of the position of the proselytes in Jewish teaching.

The broader attitude of Universalism and Noahism towards the question of proselytism is narrowed by the attitude of Particularism and from the interplay of these factors emerges the final ruling on the position of the proselyte in Jewish Law.

The purpose of Chapter 13 is to consider new attitudes towards the question of the convert to Judaism. In the beginning of the modern period we see the policy of exclusion being practised. From the seventeenth century onwards the concept of Noahism was applied. The *Haskalah* points out the influence of the spirit of toleration. A section entitled "Later Generations" deals with the distinction between the Orthodox and Reform Jewry as regards the proselyte. Another, "The Influence of Zionism" discusses the impact of this national movement on proselytism. Further on the writer bears on the most recent aspects of the subject, particularly as manifested in America, and he adduces the statements of leading Orthodox and Reform authorities anent present-day proselytism.

The Chapter terminates with an account of the personal experience of the writer on proselytism in the Jewish communities wherein he has served as Rabbi. He describes the procedure of proselytism, the course of study, the time factor and the attitude of the Jewish community towards the proselyte.

The final conclusion is that the genuine proselyte will receive fair treatment and the process of integration will secure for him a worthy position and status within the Jewish community.

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Medium:	Afrikaans

The Doctrine of Ultra Vires in Company Law

The legal capacity of persons is subject to various limitations, for instance, the limitation imposed on minors, lunatics, and persons subject to contractual, statutory or administrative restrictions, etc. A company, be it incorporated in terms of a general enabling act (such as the Companies Act) or in terms of a special act, is likewise restricted in its legal capacity.

While the normal adult person can be said to possess inherent unlimited capacity in the absence of certain specific restrictions, the capacity of a company is by its very nature circumscribed, first and foremost by its natural inability to perform acts intrinsically associated with human conduct, such as entering into a marriage, etc. The distinctive status attributed to a company as a legal entity determines certain limitations, whereas others again are attributable to general law or to statutory provisions. These limitations are common to all companies; in contrast the doctrine of *ultra vires* imposes restrictions which vary from company to company. This doctrine implies that a company's objects clause limits its power to act to those objects expressly stated therein and to those ancillary thereto. Every act beyond the ambit of the objects clause is *ultra vires* the company and for that reason invalid. This principle was in the first instance designed to protect creditors and shareholders of the company. The wording of the objects clause accordingly determines the extent to which each company is limited in its capacity.

Though the term *ultra vires* is sometimes used to denote acts beyond the capacity of natural and fictitious persons, the *ultra vires* concept is here examined only in so far as it relates to the doctrine of *ultra vires* in company law.

The practical difficulties which attend the doctrine derive, from the premise that a company's sphere of existence is inevitably determined by its stated objects. Furthermore, since a company's objects can be ascertained from its public documents, it is, in terms of the

doctrine, irrebuttably presumed that every person dealing with a company is fully acquainted with the contents of its objects clause. In view of these considerations it cannot be assumed that a company is empowered as a matter of course to perform any given act. If a person acts on such a presumption and the transaction happens to be *ultra vires*, he cannot hold the company to the undertaking purportedly assumed on behalf of the company. In these circumstances even a plea of estoppel is of no avail since the company is held to be incapable of extending its sphere of existence by its own acts and the third party is in addition legally presumed to have been aware of the extent to which the company's capacity had been limited.

The *ultra vires* doctrine is not the result of prior investigation into the nature of the corporate entity in legal theory. The first indications of the eventual doctrine are to be found in the law relating to chartered companies which was the prevailing corporate form in the centuries prior to the first general enabling English Joint Stock Companies Act of 1844; these became even more apparent subsequent to the passage of the so-called Bubble Act of 1720. After the emergence of the company incorporated by statute in the 18th century the notion crystallized that the powers of a statutory creature must inevitably be confined to the objects for which it was created. When the company incorporated in terms of a general enabling act became a reality in the mid 19th century, the English courts vacillated in their approach towards this new entity. They wavered between adopting the law relating to partnerships (more specifically that relating to the so-called deed of settlement association) or the law relating to statutory companies. The House of Lords in *Ashbury Railway Carriage and Iron Co. v. Riche* (1875), L.R. 7 H.L. 653, eventually favoured the analogy of the statutory corporation. Henceforth the basis of the doctrine was firmly established in English case law. This doctrine was thereafter received into South African law in its entirety. Though it was never afforded formal recognition in South African or English legislation, the doctrine was none the less applied and developed as a substantive part of the law.

An analysis of the practical application of the doctrine reveals many unsatisfactory aspects. To begin with, the desired protection of shareholders and creditors failed to materialize. Not only is the basic consequence that a third party runs a risk in order to ensure that the interests of shareholders and creditors are not jeopardized without merit, but it also fails to secure the much vaunted protection of shareholders. With regard to creditors, the doctrine, far from providing protection, creates a real threat. The rule underlying the doctrine implying constructive notice of the objects has produced most undesirable results: it presents the company with the opportunity of taking refuge behind its own limited capacity while the other contracting party is at all times deemed to have been aware of these limitations. Similarly estoppel cannot be raised against a

company with a view to holding it to an *ultra vires* transaction. Yet a company preferring extensive powers can easily circumvent the limitations imposed by the doctrine by virtue of the rules of interpretation applied to the so-called independent objects clause. The ordinary rules of agency, especially those relating to the right of recourse against an agent who exceeds his authority, have been modified, as a result of the doctrine, to the detriment of third parties. Since an *ultra vires* contract is void *ab initio*, the third party is unable, even on judgment by default or judgment at the consent of the company, to enforce any rights under such an agreement. In addition, the exceptions which have been made to the strict application of the doctrine, reveal striking inconsistencies.

To determine whether the doctrine is indeed such an integral part of the dogmatic concept of company law as to be indispensable, it is necessary to examine, firstly, administrative law, where a similar doctrine obtains, and, secondly, the company law of other civilized countries. In administrative law the doctrine serves as a useful restraint against arbitrary exercise of executive power and is, in any event, applied much more flexibly than in company law. Consequently the same problems have not arisen. Turning next to a comparative study of other legal systems, we find that the company law of Germany (which is representative of the countries applying German orientated company law) and the company law of France and Holland (which are representative of the countries applying French orientated company law) afford clear proof that these systems function well despite the absence of anything comparable to the *ultra vires* doctrine. Even the company law of the majority of the states in the U.S.A., which adopted English company law at the outset and then achieved a higher level of development, bears witness to the fact that rejection of the doctrine, be it by way of legislation or judicial evolution, presents distinct advantages without any corresponding disadvantages.

There can be little doubt that South African company law should rid itself of the doctrine. It did not form part of the English company law prior to the decision in 1875 in *Ashbury Railway Carriage and Iron Co. v. Riche*. Nor is it indispensable today. The chartered company of English law still serves as a living example of a corporate entity successfully functioning unfettered by any doctrine of *ultra vires*: it simply performs all acts which a corporate entity is by its nature capable of performing.

Since acts of directors which fall beyond their power are continually referred to as acts *ultra vires* the directors and since the rules relating to such acts are often (if erroneously) treated as part of the *ultra vires* doctrine, it is important to establish the exact legal position of a company director. In the internal organisation of a company, the board of directors (and occasionally even individual directors) assumes the role of an organ of the company with the exclusive authority to decide on matters within their jurisdiction.

However, as soon as external acts are performed on behalf of the company the board or individual directors (unlike their counterpart in Continental systems) are acting not as its organ but as its agent. Ordinary principles of agency thus apply. And in this situation the doctrine of *ultra vires* is only concerned with the legal capacity of the principal (the company) and not with that of the agent. It is in this light, too, that the so-called rule in *Royal British Bank v. Turquand* must be viewed.

A reform of that part of the law at present governed by the *ultra vires* doctrine is hardly feasible without the abolition of the entire doctrine by legislation. In providing an alternative two fundamental principles must be observed: firstly, that directors act as agents of the company with regard to its external activities and not as its organs, and, secondly, that the powers of the company as principal cannot be limited by its objects. Nevertheless, each company should be required to state its basic object(s) which will (as is the case at present in terms of Section 16 of the Companies Act) serve as a contract between the company and its members and which they can invoke when the company proposes to depart therefrom. It is therefore suggested that legislation along these lines provide as follows:

- (a) The capacity of the company can in no way be limited by its objects clause.
- (b) If limitations are placed on the directors or other agents of the company, such limitations are to be stated in one of the public documents of the company. Whenever any agreement is entered into on behalf of the company a copy of such restrictions must be made available on request, but the onus must always rest on the agent of the company to draw the attention of the other party thereto. Failure to do so would render the company liable as if no limitations existed, but the company, or any of its members in a shareholders' representative action, will be entitled to claim damages from such agent.
- (c) The rule relating to constructive notice must be abolished.
- (d) The objects clause must be retained to constitute the contractual basis between shareholder and company. (Since the capacity of a company will no longer be limited by its objects, the necessity for the extensive objects clause will no longer exist.)
- (e) Every member must have the right, as at present, to restrain the company from engaging in transactions which are not covered by the objects clause.

These recommendations substantially correspond with the more advanced company law systems founded on the precepts of English company law. A significant advantage will be that the company is deprived of the unjust and unequal advantage it has hitherto enjoyed at the expense of third parties.

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 Medium: English

An areal space is a differentiable manifold X_n of n dimensions in which for some positive integer $m < n$, the area of m -dimensional surfaces is defined by a parametric surface integral of the form

$$\int \dots \int F(x^i, \frac{\partial x^i}{\partial t^\alpha}) dt^1 \dots dt^m,$$

where the x^i ($i = 1, \dots, n$) are coordinates in X_n and the t^α ($\alpha = 1, \dots, m$) are the surface parameters. The fundamental function F is assumed to be positive and to be such that the value of the above integral is independent of the choice of the surface parameters t^α . The study of these spaces was inaugurated by E. Cartan¹⁾ in 1933 and has since been taken up by many investigators, notably the Japanese school under A. Kawaguchi. Most writers have approached the subject from the point of view of a generalisation of Finsler geometry, and, in consequence, the theory shows a decided dependence on concepts associated more with length than with area. This thesis is an attempt to re-develop the theory of areal spaces, in which we maintain area as the central notion. We are guided by the theory of multiple integral problems in the calculus of variations, and our principal results concern the class of parametric integral problems in this discipline. Apart from the purely introductory first chapter, the thesis may be regarded as being divided into two parts — dealing first with the local geometry and then with the extremal surfaces of areal spaces.

¹⁾ E. Cartan: Les espaces métriques fondés sur la notion d'aire. Actualités Sci. Ind. 72 (1933).

In the second chapter we consider an n -dimensional *complex vector space* V_n (vectors denoted by X, Y, \dots etc.) the Grassmann cone GK_n^m of simple m -vectors $X_1 \wedge \dots \wedge X_m$ of which is endowed a priori with a symmetric, bi-linear strictly-positive inner-product $(Y_1 \wedge \dots \wedge Y_m, X_1 \wedge \dots \wedge X_m)$. In terms of this innerproduct we define orthogonality of m -dimensional subspaces of V_n , and area of m -dimensional simplexes and parallelepipeds, and then establish counterparts of the theorem of Pythagoras, the Schwartz inequality and the triangle inequality. We define the orthogonal complement space V_m^\perp of an m -dimensional subspace V_m , and characterise those inner-products for which the orthogonal complement V_m^\perp is the intersection of all subspaces which are orthogonal to V_m . Such inner-products will be said to satisfy the simplicity condition.

In the third chapter we return to areal spaces, firstly applying the results of the previous chapter to "Riemannian" areal spaces in which the fundamental function assumes the form

$$F(x^i, \dot{x}_a^i) = \sqrt{g_{IJ}(x^k) p^I p^J},$$

where

$$p^I = m! \dot{x}_{[1}^{i_1} \dots \dot{x}_{m]}^{i_m}, \quad \dot{x}_a^i = dx^i/dt^a,$$

and a repeated capital latin index implies summations over all distinct combinations of its constituent small indices. In such spaces an inner-product of the type considered above is defined by the given $2m$ -tensor g_{IJ} . Guided by this simple case, we extend our considerations to general areal spaces, and arrive at the conclusion that the inner-product

$$(x^i, Y_1 \wedge \dots \wedge Y_m, X_1 \wedge \dots \wedge X_m) = F^{2-m}(x^i, Y_a^i)$$

$$\det \left(\frac{\partial F(x, Y_\beta^j)}{\partial \dot{x}_a^i} X_\epsilon^i \right),$$

first considered by Iwamoto²⁾, is the only inner-product which is unilinear, satisfies the simplicity condition, and is such that

$$(x^i, X_1 \wedge \dots \wedge X_m, X_1 \wedge \dots \wedge X_m) = F^2(x^i, X_a^i),$$

while, if V_m is spanned by the vectors Y_a^i , then V_m^\perp is the totality of vectors Z^i such that

$$\frac{\partial F(x^i, Y_a^i)}{\partial \dot{x}_\varepsilon^j} Z^j = 0.$$

This latter condition is necessarily true for Riemannian areal spaces, and also ensures the equivalence of the concepts of orthogonality and transversality, the latter as encountered in the calculus of variations. It is evident that the validity of the Schwartz inequality corresponding to the above inner-product is equivalent to the Weierstrass condition of the theory of Carathéodory³⁾ for multiple integral variational problems, and it is shown that if the fundamental function satisfies the well-known Hadamard necessity condition⁴⁾ then it is convex in each vector argument.

The remaining sections of the third chapter are devoted to the introduction of a Hamiltonian function H for areal spaces — the definition of this function is suggested by the foregoing work, but depends on the condition

$$\det \left(\frac{\partial^2 \left[\frac{m}{2} F^m \right]}{\partial \dot{x}_a^i \partial \dot{x}_\beta^j} \right) \neq 0,$$

which, for $m \geq 2$, is shown to be equivalent to the condition

$$\det \left(\frac{\partial^2 F}{\partial \dot{x}_a^i \partial \dot{x}_\beta^j} \right) \neq 0.$$

²⁾ H. Iwamoto: On geometries associated with multiple integrals. *Math. Jap.* **1**, 74–91 (1948).

³⁾ C. Carathéodory: Über die Variationsrechnung bei mehrfachen Integralen. *Acta Szeged* **4**, 193–216 (1929).

⁴⁾ H. Boerner: Über die Legendresche Bedingung und die Feldtheorien in der Variationsrechnung der mehrfachen Integrale. *Math. Z.* **46**, 720–742 (1940).

The Hamiltonian function is then used to impose a similar inner-product on each dual Grassmann cone.

In the final chapter we develop a canonical formalism and Hamilton-Jacobi theory for parametric multiple integral variational problems, utilising the abovementioned Hamiltonian function, while the covariant vectors

$$y_i^a = F^{\frac{2}{m}-1} \left(x^j, \frac{\partial x^j}{\partial t^\beta} \right) \frac{\partial F \left(x^j, \frac{\partial x^j}{\partial t^\beta} \right)}{\partial \dot{x}_a^i}$$

serve as canonical momenta. (The formalism of Carathéodory breaks down for parametric integrals, although his geodesic field theory is eminently suited to such problems). After discussing some properties of transversal (orthogonal) families of surfaces, we arrive at a Hamilton-Jacobi equation in the form

$$H \left(x^i, \frac{\partial S^a}{\partial x^i} \right) = 1,$$

characterising geodesic fields, and conclude with a useful theorem concerning the integrability conditions associated with such a field.

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There are two distinct approaches to the relativistic theory of spin particles, namely the Hamiltonian and Lagrangian approaches, which are based upon variational principles involving single and multiple integrals respectively.

In the Hamiltonian approach as given by Rund [1], the equations describing the field corresponding to particles of arbitrary spin can be written in the form:

$$\left(\Gamma^j \frac{\partial}{\partial x^j} + \mu \right) \psi = 0,$$

(to be referred to as G.F.E.), where the field functions ψ transform according to some representation of the proper Lorentz group L_p , which depends on the spin of the particles in question. From invariance considerations, it follows that the Γ^j satisfy the commutation rule:

$$\Gamma^i \Gamma^{jk} - \Gamma^{jk} \Gamma^i = \delta^{ij} \Gamma^k - \delta^{ik} \Gamma^j,$$

(to be referred to as F.C.R.) where the Γ^{jk} are the infinitesimal operators of L_p corresponding to the representation in question. In addition it was shown in the above paper that for specific physical systems, the Γ^j satisfy distinct sets of commutation rules. The difficulty encountered in this approach is that the representation of L_p associated with the field functions ψ for different physical systems cannot be identified with irreducible representations of L_p .

The purpose of this thesis is to obtain a Lagrangian formalism such that the resulting field equations have the form G.F.E., and to investigate which representations of L_p correspond to the field functions ψ for different physical systems. We are also interested in whether the relevant commutation rules, in particular the commutation rule F.C.R., can be obtained from the Lagrangian formalism.

Section I is devoted to the necessary mathematical background. In Chapter 1, two-component spinors (or more briefly 2-spinors) are defined, using as the underlying differentiable manifold the Minkowski 4-world of the special theory of relativity (see for example Van der Waerden [1]). The well-known homomorphism between the 2×2 unimodular group and the proper Lorentz group in 4-dimensions is used to motivate the introduction of 2-spinors. The various 2-spinors which are invariant with respect to the 2-spinor transformation law are obtained. It is found that an invariant 2-spinor with mixed dotted and undotted indices does not exist, a fact which is of significance when we consider a Lagrangian formalism involving 2-spinors.

Certain fundamental spin-tensors, that is, entities with both tensor and spinor indices, are introduced, and are shown to satisfy an important commutation rule. The relationship between 2-spinors and the finite dimensional representations of L_p is discussed, and the relations between arbitrary 2-spinors and tensors are obtained, using the above-mentioned fundamental spin-tensors.

In Chapter 2, the concept of a four-component spinor (or more briefly, a 4-spinor) is introduced, and the relevant transformation laws are stated (see for example Corson [1]). The structures of general, and of completely symmetric, 4-spinors of arbitrary rank in terms of 2-spinors are investigated in detail. This section is incomplete, in that the structures of 4-spinors satisfying restrictions other than that of complete symmetry are not investigated. The invariant 2-spinors obtained in Chapter 1 are used to construct the corresponding invariant 4-spinors. However, additional invariant 4-spinors, which have no counterpart in the 2-spinor theory, may be formed; in particular, an invariant 4-spinor with one dotted and one undotted index does exist.

The fundamental spin-tensors in the 4-spinor theory are defined in terms of the spin-tensors of the 2-spinor theory and satisfy an analogous commutation rule. The relations between two spinors and tensors are extended in order to obtain the tensors corresponding to a 4-spinor of rank 2. In this respect, the 4-spinor theory is considerably more complicated than the 2-spinor theory. Finally it is shown that completely symmetric 4-spinors of arbitrary rank transform according to a direct sum of irreducible representations of L_p .

Section II is concerned with the application of the 4-spinor theory to the relativistic theory of spin particles. From the known connection between the type of 2-spinor field function and the spin of the associated particles, the connection between the type of 4-spinor field function and the associated spin is derived. It is then shown that the non-existence of an invariant 2-spinor with one dotted and one undotted index leads to difficulties in the use of 2-spinors in a Lagrangian formalism for particles with spin eigenvalues $\pm \frac{1}{2}\hbar$. The postulates of the relativistic theory of spin particles are stated

explicitly, and the consequences of the theorem of Noether in the Calculus of Variations, for 4-spinors of arbitrary rank, are examined. The theory is then applied to the specific case of spin $\frac{1}{2}$ particles. It is shown that the above-mentioned difficulty in obtaining a Lagrangian formalism is avoided by the use of 4-spinors. A Lagrange function, which arises very naturally in the 4-spinor theory, is chosen, and it is shown that the corresponding Euler-Lagrange equations have the form G.F.E., and are in fact, the usual Dirac equations for spin $\frac{1}{2}$ particles. The specific commutation rule satisfied by the matrices Γ^j in this case is obtained from the commutation rule satisfied by the fundamental spin-tensors of the 4-spinor theory. The current 4-vector, the energy-momentum tensor, and the total angular momentum tensor are constructed and it is shown that the commutation rule F.C.R. is a sufficient condition for the divergence of the last tensor to vanish. For this particular case, the problem discussed in the opening paragraph is completely solved. An analogous Lagrangian formalism is given for the case of spin 0 and 1 particles. The field equations are again obtained in the form G.F.E., but no information regarding the specific commutation rules satisfied by Γ^j in this case, is obtained from the Lagrangian formalism. Using the results of Chapter 2, the 4-spinor field equations are shown to be equivalent to the usual tensor field equations for particles with spin eigenvalues 0 and 1.

REFERENCES

- CORSON, E. M. [1]: Introduction to Tensors, Spinors and relativistic wave equations. Blackie and Sons. Ltd. (1954).
- RUND, H. [1]: Hamiltonian formalism in relativistic quantum mechanics. "Hlavaty Festschrift", University of Indiana Press. (1965).
- VAN DER WAERDEN, B. L. [1]: Spinoranalyse. Nachrichten van der Gesellschaft der Wissenschaften zu Göttingen, Math-Physik Klasse, 100-109 (1929).

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 Medium: English

The thesis makes a further investigation of the hypergeometric and factorial series, and defines some new factorial series and functions associated with them. Some probability generating functions associated with the new functions are discussed.

Chapter I

This chapter presents a general description of the scope and content and background of the thesis.

Chapter II

In this chapter is defined a new notation for the hypergeometric series, viz.

$[a + bt]^{!n} = a^{!n} F(-n, -b; a - n + 1; t)$ for all n for which $(a + n)$ and $(a + b - n)$ not negative integers, where

$$a^{!r} = a(a - 1) \dots (a - r + 1).$$

By proving properties of the $[a + bt]^{!n}$ series, properties of the hypergeometric series are proved. Differentiation and integration of the series are considered, and a reduction formula is found and extended to the hypergeometric series.

The new notation is extended to another variable, and this extension is shown to be associated with the first second order hypergeometric series of Appell, viz.

$$[a + bt + cs]^{!n} = a^{!n} F_1(-n; -b, -c; a - n + 1; t, s).$$

The partial and continued differentiation of $[a + bt + cs]^{!n}$

is carried out, and a reduction formula obtained as in the univariable case.

Chapter III

In this chapter two new functions are defined: the Incomplete Factorial Beta Function,

$$\frac{Np}{N!(n+m-1)} \int_0^1 [(Np-1)x]!^{\overline{n-1}} [N-Np+\overline{Np-n}(1-x)]!^{\overline{m-1}} dx$$

for $0 < p < 1$, and n and m positive integers, and the Incomplete Factorial Gamma Function,

$$e^{-\left(\frac{N-Np}{Np}\right)} \frac{0 \int_0^\infty e^{-x} [N-Np+Npx]!^{\overline{n-1}} dx}{(Np)!^{\overline{n-1}}}$$

for positive integer n .

The incomplete factorial beta function is found to be closely associated with the partial sums of the factorial binomial series

$$\frac{1}{N!^{\overline{n}}} \sum_{x=0}^k {}^n C_x [Np]!^{\overline{n-x}} [N-Np]!^x \text{ and hence with}$$

the partial sums of the hypergeometric series of Gauss:

$$F_n(a, b; c; x) = \sum_{m=0}^{n-1} \frac{(a+m-1)!^m (b+m-1)!^m}{(c+m-1)!^m m!} x^m$$

This association leads to the possibility of expressing both the partial sums of the factorial binomial series and the partial sums of the hypergeometric series in integral form.

The incomplete factorial beta function can also be expressed as a terminating ${}_3F_2$ series, where ${}_3F_2$ has its ordinary meaning as a generalised hypergeometric series, and hence a theorem connecting the partial sums of the hypergeometric series and a ${}_3F_2$ series is obtained. Special cases of the incomplete factorial beta function are considered, e.g. $n=1$, $n=2$, etc., and $m=1$, $m=2$, etc. A multivariable incomplete factorial beta function is also defined in a form similar to a Dirichlet integral. This function is then expressed in terms of the partial sums of the F_1 multivariate series of Appell, viz.

$F_1(a; b_1, b_2, \dots, b_k; c; 1, 1, \dots, 1)$ and in terms of the partial sums of the factorial multinomial series

$$[Np_0 + Np_1 + \dots + Np_k]^{!n}.$$

The integrand of both the incomplete factorial beta function and the multivariate extension are considered as probability distributions which are analogous in the factorial case to the Pearson Type I distribution, and the moments of the probability distributions are obtained.

The incomplete factorial gamma function, also defined in this chapter, can be expressed in terms of the Partial Sums of the well known Confluent Hypergeometric Series. It is also found to be a series of ordinary gamma functions, and some special values of it are obtained.

Chapter IV

A factorial logarithmic series

$$\begin{aligned} f(p, N) &= Np \int_0^1 [\overline{N-1} - \overline{Np-1}t]^{!-1} dt \\ &= \sum_{r=1}^{\infty} \frac{(Np)^{!r}}{rN^{!r}} \end{aligned}$$

is introduced, and is seen to be a special case of the incomplete factorial beta function as defined in Chapter III. This function corresponds in the factorial case to the ordinary logarithmic series. It is also found to be associated with the digamma function, and by using properties of the digamma function, properties of this series are established. A dibeta function is also defined as

$\frac{d}{da} [\log B(a, b)]$ and is seen to be a difference of digamma functions,

and hence the factorial logarithmic series is a dibeta function.

In the second part of this chapter a bivariable and a multivariable factorial logarithmic series are also defined and properties similar to those above in the univariable case are obtained. Using these functions, a theorem in more variables similar to the known theorem $F_1(a; b_1, b_2; c; 1, 1) = F(a, b_1 + b_2; c; 1)$ is obtained.

Chapter V

The final chapter deals with a special case of the four second order hypergeometric series of Appell; the case where the two variables x and y are connected by the relationship $y = x^2$.

These series are of particular interest as probability generating functions, and further properties of these are established. Firstly the coefficient of x^2 is obtained in the four series, and the series are then expressed as power series with the coefficients found to be hypergeometric series. The series are also differentiated, and integral representations are established. The probability generating function associated with $F_1(a; b_1, b_2; c; t, t^2)$ is considered. The factorial moment generating function $z = F_1(a; b_1, b_2; a + b_1 + b_2 - c + 1; -a, -2a)$ is found to satisfy a differential equation found by J. L. Burnchall. Using the above differential equation the factorial moments are obtained, and a recurrence relation between these moments is found. The moment generating function is established, and hence the ordinary moments.

Further, the bivariable and trivariable extensions of the first of these hypergeometric series are discussed. Partial differentiation and integral representations of these series are also established, and the probability generating functions corresponding to them are investigated. Differential equations which are satisfied by the factorial moment generating functions are obtained in a manner similar to that for the univariate case, and the moments are established.

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Medium: Afrikaans

Doel van hierdie studie

Die doel van hierdie studie in verband met die verdeling van ekonomiese populasies is tweeledig: *eerstens* is dit 'n poging om aan te toon tot welke mate die ekonomiese verdelings in die Republiek van Suid-Afrika by benadering lognormaal verdeel is, of saamgestel is uit verskillende benaderde lognormale komponente; *tweedens* is die doel van hierdie studie om die doeltreffendheid van die belangrikste skattingsmetodes soos toegepas op steekproewe uit lognormale verdelings of saamgestelde lognormale verdelings, onderling te vergelyk.

In hierdie studie word hoofsaaklik van grafiese voorstellings gebruik gemaak om die onderlinge verwantskap tussen die belangrikste parameters van lognormale- en saamgestelde lognormale verdelings te illustreer en die vorm van die verskillende tipe verdelings uit te ken. Daar word hoofsaaklik empiries te werk gegaan om die bestaande skattingsmetodes uit te toets, die eienskappe van saamgestelde lognormale verdelings te ondersoek en na te gaan onder welke omstandighede die saamgestelde verdelings in hulle komponente opgesplits kan word.

Inhoud van die studie

Die verhandeling het vier hoofstukke. In die begin van hoofstuk een van die studie word die eienskappe van 'n lognormale verdeling breedvoerig behandel, en in die laaste helfte van die hoofstuk word die verdelings wat saamgestel is uit twee lognormale komponente van nader besigtig. Die vernaamste momente van die saamgestelde verdeling word uitgedruk in terme van die momente van die komponente. Die verandering wat die momente van die saamgestelde

verdeling ondergaan indien die verhouding van die saamgevoegde komponente verander, word empiries ontleed en grafies voorgestel.

In hoofstuk twee word die skattingsmetode van momente en die metode van maksimum aanneemlikheid op lognormale verdelings toegepas ten einde 'n vergelyking te kan tref tussen die doeltreffendheid van die twee skattingsmetodes. Deur die gebruikmaking van tabelle met ewekansige normaalverdeelde veranderlikes is twintig kunsmatige steekproewe van 50 elk uit vier hipotetiese lognormaalverdeelde populasies saamgestel. Vir elk van die steekproewe is die vernaamste parameters bereken. Die spreidings van die steekproefskattings om hulle populasie parameters is bereken ten einde te kan bepaal watter skattingsmetode die doeltreffendste resultate lewer. Hoofstuk twee word afgesluit met 'n studie van die doeltreffendheid van die skatting van die rekenkundige gemiddelde van 'n lognormale verdeling uit 'n gestratifiseerde ewekansige steekproef. Die populasie word in verskillende grootte groepe verdeel wat as strata dien.

In hoofstuk drie word bogenoemde twee skattingsmetodes uitgebrei tot verdelings wat saamgestel is uit twee lognormale verdelings. Daar word 'n onderskeid gemaak tussen saamgestelde verdelings waarvan die lognormale komponente voor die trekking van die steekproef reeds bepaal is, en die waar die twee lognormale komponente uit die steekproewe geskat moet word. Die doeltreffendheid van die skatting van 'n saamgestelde populasie se rekenkundige gemiddelde deur die trekking van 'n gestratifiseerde steekproef word ook nagegaan.

Ten einde die eienskappe van saamgestelde lognormale verdelings te ondersoek word in die tweede gedeelte van hoofstuk drie 'n paar kunsmatige verdelings saamgestel. Ook word aan die einde van die bespreking van elk van die kunsmatige verdelings, nagegaan tot welke mate die saamgestelde verdeling, met behulp van bestaande statistiese metodes, in sy lognormale komponente opgesplits kan word.

Die studie word afgerond in hoofstuk vier met die praktiese toepassing van die bevindinge op voorbeelde van statistiese verdelings wat verkry is uit 'n aantal ekonomiese bedrywighede in die Republiek van Suid-Afrika.

Vernaamste gevolgtrekkings

By die skatting van die populasie rekenkundige gemiddelde deur die m.a.-metode word van die verwantskap wat vir 'n lognormale verdeling tussen die meetkundige- en rekenkundige gemiddelde bestaan, gebruik gemaak. In die praktyk is die verdelings egter benaderd lognormaal verdeel en toon meestal relatief groot afwykings by die begin en eindwaardes van die verdeling. Dit maak die m.a.-skattingsmetode minder doeltreffend. Die momenteskatter kan maklik bereken word en lewer vir lognormale verdelings met standaardafwyking-verhouding van ongeveer 2.5 bykans net so

doeltreffende resultate as die m.a.-metode. Vir 'n standaardafwyking-verhouding groter as 2.5 neem die doeltreffendheid vinnig af.

Beide metodes lewer by die skatting van die standaardfout minder doeltreffende resultate as by die skatting van die rekenkundige gemiddelde. Die momenteskatter is gemiddeld laer as die m.a.-skatter, en onderskat in die meerderheid gevalle die populasieparameter $\sigma_{\bar{X}}$.

Ten einde die standaardfout van die steekproefgemiddelde binne redelike grense te beperk, en ten einde van die normale benadering gebruik te kan maak, moet 'n eenvoudige ewekansige steekproef vir beide skattingsmetodes so groot wees dat net so wel 'n totale opname gemaak kan word.

Vir beide skattingsmetodes is die skatter $S_{\bar{X}}$ positief gekorreleerd met die steekproefgemiddelde \bar{X} . Dit het die gevolg dat in die meerderheid van gevalle waar die interval $\bar{X} \pm 1.96 S_{\bar{X}}$ nie die populasie rekenkundige gemiddelde insluit nie, die steekproefskatter \bar{X} kleiner is as die populasie rekenkundige gemiddelde. Die spreiding van die onderste vertroubaarheidsgrense is vir die twee metodes baie dieselfde en is kleiner as die spreiding van die boonste grens. Soos die standaardafwyking-verhouding toeneem, so neem die verskil tussen die spreiding van die boonste- en onderste grens ook toe.

Waar die waardes van die onderskeie items van die populasie uit 'n vorige opname bekend is, en waar die waarde nie vinnig verander oor die tyd nie, kan die populasie gemiddelde baie doeltrefferder geskat word deur die trekking van 'n gestratifiseerde steekproef. Die verskillende grootte groepe word as strate gebruik. Hoe groter waardes die standaardafwyking-verhouding aanneem destes voordeliger is dit om van 'n gestratifiseerde steekproef in plaas van 'n eenvoudige ewekansige steekproef, gebruik te maak. Dit geld ook vir saamgestelde lognormale verdelings.

By die berekening van die momenteskatter van 'n saamgestelde populasie waar die lognormale komponente nie vooraf bepaal is nie, is dit ook nie nodig om die steekproef in sy lognormale komponente op te splits alvorens 'n momenteskating van die populasie se rekenkundige gemiddelde gemaak kan word nie. By die berekening van die m.a.-skatting van die populasie se rekenkundige gemiddelde is dit wel nodig om die steekproef in sy lognormale komponente op te splits. Die metodes waarvan gebruik gemaak word om 'n steekproef in sy lognormale komponente op te splits, is op die oomblik nog so onbetroubaar dat die m.a.-skattingsmetode onder bogenoemde omstandighede nie aanbeveel word nie.

Die verdelings van ekonomiese data vir die Republiek van Suid-Afrika wat in die studie ontleed word, bestaan uit een of meer

komponente waarvan minstens een lognormaal verdeel is. Die belangrikste komponente van die verdeling is in al die gevalle benaderd lognormaal verdeel. Vir gevalle waar die aantal items van die residue komponente, wat meestal aan die begin en einde van die verdeling voorkom, klein is, kan die verdeling sonder groot verlies van akkuraatheid as 'n enkelvoudige lognormale verdeling beskou word. 'n Residue komponente aan die bopunt van die verdeling het egter 'n baie groter invloed op die rekenkundige gemiddelde van die verdeling as een aan die beginpunt.

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Medium: English

Although the South African Bantu for generations has been in contact with European civilization, factors such as poverty and lack of training have prevented them from developing their musical talent. During the last few decades they have also been brought into contact with the less desirable aspects of European music, especially by means of the cinema and the radio. On account of these reasons it would be advisable to detect real potential musical aptitude in the Bantu child and to develop this by suitable practice before the contaminating factors have had time to affect the Bantu's musical tastes.

This dissertation represents a pilot study of the problem of the testability of the musical aptitude of urban Bantu children. Since a close relationship may be expected to exist between muscular dexterity and musical aptitude it was decided to trace the relationship between musical aptitude and certain visual, auditory and psychomotor determinants in the subjects selected for the experiment.

The subjects were Bantu school children, living in an urban environment, and aged from 10 to 18 years. They had been born and had lived all their lives in an urban environment. Nonetheless, their only contacts with European music had been the music used in religious practice, music heard in cinemas, on the radio and gramophone records, plus some training received in Sol-fa at school. However, since the ordinary white child's contact with western music is not very dissimilar from that of the urban Bantu child, except, perhaps that the white child goes to the cinema more frequently and has more time to listen to jazz music, it was assumed in this study that tests for musical aptitude suitable for white children could also be used with Bantu children. For this reason the Seashore Test for Musical Talents was selected, and this test was applied together with certain tests of visual-motor muscular dexterity.

Certain hypotheses were drawn up, the principal ones being that a relationship exists between musical talent and muscular reac-

tion time, that sex differences in performance, as well as age differences can be expected, that educational status will affect achievement, and that a correlation can be expected between pitch, loudness, rhythm, time, timbre discrimination and tonal memory.

The subjects consisted of 109 girls and 95 boys. Since tribal differentiation was not recognized in their educational system, the children were not divided into tribal groups.

The relationship between musical talent and muscular reaction time

- (a) Pitch discrimination: No relationship was found to exist between visual and auditory reaction time on the one hand, and pitch discrimination on the other hand; the same applied to two-handed co-ordination.
- (b) Loudness: Statistically significant correlations between loudness discrimination, visual reaction time and auditory reaction time were found but no significant correlation could be established between loudness discrimination and two-handed co-ordination.
- (c) Rhythm: A proven relationship was found to exist between rhythm discrimination, visual reaction time, and two-handed co-ordination (although in the negative in the latter case).
- (d) Time: A proven relationship was found to exist between time discrimination and visual and auditory reaction time.
- (e) Timbre: Only auditory reaction time correlated significantly, though negatively, with timbre discrimination.
- (f) Tonal memory: A proven inverse relationship was found between tonal memory discrimination and auditory reaction time.

The conclusion could, therefore, be drawn that the only nearly common denominator between the Seashore Test of Musical Talents and the Dexterity Tests was the auditory function, which was obviously very important in the Talents Test as well as in the auditory reaction test. The number of positive correlations between visual reaction time and the Seashore Test, as well as the two-handed co-ordination test and the Seashore did not warrant the conclusion that visual reaction time and two-handed co-ordination were of very great importance in musical aptitude.

As regards the relationship between musical reaction time and musical talent the results showed both positive and negative correlations. However, these correlations were found to be inconsistent, unpredictable and inexplicable.

Sex differences

Boys seemed to yield performances superior to those of girls in the fields of loudness, rhythm and tonal memory. Their performance in the dexterity tests was equal to that of the girls. Al-

though their performance was not superior in all the musical talent tests, the boys, on the whole, yielded better results on the Seashore tests than the girls. These results were consistent but, objectively speaking, inexplicable.

Age differences

The results showed that, on the whole, achievement improved with age, but the difference in achievement was greater at the lower age levels (12 and 14 years) than at the higher age levels (14 and 16 years). The improvement with age was, however, inconsistent in the sense that the different talents did not appear to improve at a consistent rate.

The correlation between pitch, loudness, rhythm, time, timbre discriminations and tonal memory

Except in the case of time discrimination, the general tendency was towards individual rather than unitary functioning. The overall impression was that each of the musical talents had a definite individualistic function in the Gestalt of musical aptitude as measured by the Seashore Tests.

The above conclusions apply in respect of the sample used in the experiment only — a group of urban Bantu children — and the author does not suggest that similar results will be found with other Bantu population groups. However, a vast field of future research is possible, especially investigations among Bantu people who have had little or no contact with Western European music.

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Medium:	English

Statement of the problem

The purpose of this investigation was the study of training Bantu Supervisors using T.W.I. programmes. Literature on the various training methods and courses used elsewhere and in this country was reviewed. The majority of these courses were found to be biased either towards human relations or technical training. A marked imbalance existed between the human relations content and technical knowledge content in such courses. A case study of a method used to train Bantu Supervisory personnel on the mines is cited.

The objectives in this experiment were broad, being to determine:

- (i) Whether trainee Bantu Supervisors did learn anything from taking T.W.I. courses.
- (ii) What they learned from these courses.
- (iii) What they failed to learn from T.W.I. courses and what the possible reasons were for this failure.
- (iv) What difficulties the trainee Bantu Supervisors experienced in learning T.W.I. principles
- (v) How they evaluated the T.W.I. course.
- (vi) What problems they anticipated when applying the principles in the work situation.

Method of research and procedure

Sample: A sample of 36 subjects took part in the experiment and were given a number of tests. This sample was divided into 2 groups each comprising 9 supervisors and 9 non-supervisors with supervisory potential. The two groups were equated on population variates, namely age, education, intelligence and experience. The

samples were derived from two mining groups, namely a diamond mining group and a gold mining group.

Training: Samples were tested and selected initially. The experimental group was subjected to three weeks' training using the three T.W.I. programmes, namely Job Instruction, Job Methods and Job Relations. The experimental and control groups were then tested again using the three measures of learning of T.W.I. principles, viz, T.W.I. test, problem test and How Supervise? test, and C.M.I. test.

Results

F-tests showed a significant difference between the performance of the experimental group and control group, indicating that learning did in fact, take place among the training group.

The trained group learned to respond positively to those items of the test *How Supervise?* which are relevant to their perception of and experience in the work situation. They have learned that they need to be trained in order to create healthy work climates in which the needs of the worker can be satisfied.

The trained group fails to see the area of supervision in which they require training. This response results from their failure to comprehend the scope of their function. It also stems indirectly from their failure to reconcile the conflict between the ideals set by the T.W.I. principles and the hard reality of the work situation which often tends to go counter to these ideals.

The three measures of learning of T.W.I. principles differentiate significantly between the trained and untrained groups. They all seem to be adequate measures of learning of T.W.I. principles.

The How Supervise? test seems to measure something more than reading ability. It seems to be related to principles of supervision.

The conformance score (CF) of the Welsh Figure Preference Test correlates positively and significantly with the T.W.I. test and the SP and SO sub-tests of Form A of the test How Supervise?. There is some indication that this test could be used as a useful screening tool when selecting those who are likely to benefit from supervisory training. Further research into the use of this test for the screening of those with supervisory potential is advised before conclusions can be reached.

Learning difficulties are mainly connected with Job Methods, and fall into two categories:

- (a) Management Problems: These problems relate to established practice on the mines wherein Method study falls outside the domain of a boss-boy. Trainees therefore fail to visualise the role which they should play in method improvement since it does not fall within their scope of function.
- (b) Personal Problems: Job Methods fail to motivate trainees. We established that individuals tend to learn selectively, and that they will learn best in those areas which appear to be relevant to their needs. Job Methods has no cash relevance.

Job Methods is also highly technical and trainees find difficulty in understanding it fully.

In evaluating the courses, trainees stress the importance of Job Relations and Job Instruction in that order.

Problems anticipated by the Bantu Supervisors in their attempts to apply the T.W.I. principles fall into two categories:

- (a) Black-White Supervisor relations: The training of the Bantu supervisors is seen as being undermined by the White Supervisor who is the Bantu Supervisor's immediate senior. The white supervisor is seen as lacking confidence in the Bantu supervisor's leadership and technical competence.
- (b) Management Problems: Inadequacy of management support is cited as a factor limiting the development of the Bantu supervisor.

Implications of the investigation and conclusion

This exercise strongly indicates the need to increase efforts in training Bantu Supervisors and also points to their trainability.

With modifications to suit different work situations the present T.W.I. programmes, namely, Job Instruction and Job Relations, seem adequate for developing Bantu Supervisors. Job Methods seem, at present, to be beyond the scope of comprehension of the average Bantu mining Supervisor.

Management support of any training effort and a judicious follow-up of which training should give us an answer to the question whether Bantu Supervisors can put T.W.I. principles into practice in the work situation.

T.W.I. training should be supplemented by other forms of training such as induction and skills training.

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Title/Titel:	<i>Die opstel en voorlopige standaardisering van 'n battery skolastiese aanlegtoetse met die oog op die voorspelling van sukses in die Bantoe Junior Sekondêre Skool</i>
Medium:	Afrikaans

Probleemstelling en doel van ondersoek

As gevolg van 'n tydelike tekort aan klaskamers en ander noodsaaklike fasiliteite by sekere na-primêre Bantoeskole, het die keuring van leerlinge vir toelating tot die junior sekondêre skool 'n noodsaaklikheid geword. Waar tot dusver slegs die resultate van die standerd-VI-eindeksamen gebruik is vir die oorplasing van leerlinge na die junior sekondêre skool, blyk dit dat daar naas hierdie eksamen ook 'n groot behoefte aan gestandaardiseerde toetse bestaan. Hierdie ondersoek is aangepak om 'n begin te maak met die standaardisering van 'n battery Skolastiese Aanlegtoetse met die oog op die voorspelling van sukses in die Bantoe Junior Sekondêre skool.

Metode van ondersoek

Die uitvoering van hierdie ondersoek het uit twee hoofstappe bestaan. As eerste stap is besluit om 'n battery van agt sub-toetse, waarvan sommige reeds op Blankes in Suid-Afrika gestandaardiseer was, saam te stel en vir eksperimentele doeleindes op vyf van die sewe hoof Bantoe taalgroepe van die Republiek toe te pas. Hierdie toepassing was hoofsaaklik daarop gemik om tekortkominge en swakhede in die toetsprosedures en toetstegnieke waarop besluit was, bloot te lê. Daar is verwag dat 'n ontleding van die resultate wat met hierdie toepassing verkry is, lig op doeltreffende tegnieke en prosedures sou werp wat veral van waarde sou wees by die opstel en voorlopige standaardisering van die battery Skolastiese Aanlegtoetse.

Op grond van die gegewens en bevindings wat met die eksperimentele toepassing ingewin is, is as tweede stap 'n battery van ses subtoetse opgestel en op 'n steekproef gelyksoortig aan die bevolking vir wie die finale toets bedoel was, toegepas. Resultate is eerstens ontleed om 'n aanduiding te kry van hoe die toetse in die geheel in die praktyk funksioneer. Tweedens is alle items van elke

afsonderlike toets ontleed met die doel om swak items te identifiseer. Hierna is 'n finale battery toetse saamgestel en in gereedheid gebring vir finale standaardiseringsdoeleindes.

Die eksperimentele ondersoek

Op grond van 'n studie van bepaalde literatuur in verband met tegnieke wat reeds ontwerp is om in die behoeftes van die voorspelling van sukses op skool te voldoen, is besluit om toetse wat 'n aanduiding van leerlinge se bekwaamheid in die amptelike tale, rekenkundige vermoë, verbale en nie-verbale redenering sou gee, op te stel en verder te ontwikkel.

Die battery toetse is gedurende September en Oktober 1960 deur opgeleide Bantoe-toetsafnemers afgeneem. Die doel van hierdie toepassing was hoofsaaklik eksperimenteel van aard, maar was daarop gemik om gebreke en tekortkominge in die toetsprosedure bloot te lê en om die beste subtoetse op grond van betroubaarheid- en geldigheidstudies te keur vir verdere ontwikkeling. 'n Totaal van 2,408 leerlinge wat vyf Bantoe-taalgroepe verteenwoordig, is tydens die eksperimentele ondersoek betrek. Met die uitsondering van die nie-verbale Klassifikasietoets is daar deurgaans bevredigende betroubaarheids- en geldigheidskoëffisiënte vir alle toetse en alle taalgroepe verkry. Weens die lae indekse wat in die geval van die Klassifikasietoets verkry is, is besluit om hierdie toets nie verder te ontwikkel nie.

Dit het geblyk dat alle standerd VI-Bantoeleerlinge nie in staat was om die toetsaanwysings wat direk op die toetsboekies aangebring was, te volg en uit te voer nie. Aanwysings wat mondelings aan die leerlinge gegee word, skyn bevredigende resultate te lewer.

Aangesien 'n subjektiewe faktor wel 'n rol by die nasien van die voltooiingstoetse gespeel het, is besluit om slegs van veelkeusige toetsitems gebruik te maak. Hierdie besluit sou groter objektiwiteit by die nasien van die toetse teweegbring en ook die nasienproses vereenvoudig.

Spoed, akkuraatheid en ekonomiese voordele was die belangrikste oorwegings vir die besluit om van spesiale antwoordblaaie gebruik te maak. Moontlike nadele wat die gebruik van spesiale antwoordblaaie by die Bantoe wat nie so toetsgesofistikeerd as die Blanke is nie, inhou, verdien egter verdere aandag en moet deur basiese navorsing opgevolg word.

Samestelling van die toetsbattery

Aan die hand van inligting wat op grond van die eksperimentele ondersoek ingewin is, is die battery Skolastiese Aanlegtoetse opgestel. Die battery het uit die volgende subtoetse bestaan:

Taaltoetse in die amptelike tale en in die moedertaal van die leerlinge.

Rekenkundefoets.

Verbale Redenering wat in die moedertaal voorgelê word.

Nie-verbale Redenering wat uit 'n Patroonvoltooiingstoets bestaan.

Voorsiening is vir twee voorlopige vorms gemaak sodat daar na 'n proses van itemontleding een finale reeks toetse opgestel kon word.

Alvorens die battery Skolastiese Aanlegtoetse vir die doeleindes van itemontleding toegepas kon word, was dit nodig om die toetsaanwysings eers in die praktyk uit te toets. Dit is op 'n steekproef van 124 Tswana-, 137 Sepedi-, en 60 Zoeloe-leerlinge in Pretoria en omgewing gedoen. Hierdie uittoetsing het aan die lig gebring dat gedetailleerde aanwysings wat mondelings deur die toetsafnemer in die moedertaal van die betrokke leerlinge gegee word en wat sover moontlik met demonstrasie op die swartbord aangevul word, die beste resultate lewer.

Veel klem moet op die oefenvoorbeelde gelê word sodat leerlinge oefening in alle soorte response wat van hulle tydens die werklike beantwoording van die toetsitems verwag word, kan ontvang. Die moeilikheidsgraad en diskriminasiewaardes van elke item is by wyse van 'n itemontleding vir die vyf hoof etniese taalgroepe verkry. Die toepassing het op 2,150 standerd-VI-Bantoeleerlinge geskied.

Vir elke subtoets is 40 items uit albei vorms gekeur om in die finale toetse opgeneem te word. Hierna is die finale battery toetse saamgestel.

Die volgende resultate gee 'n aanduiding van die betroubaarheid en geldigheid van die voorlopige toetse. Die laagste en hoogste betroubaarheidskoeffisiënte wat op grond van die K-R 20 formule bereken is en eintlik 'n skatting van die homogeniëiteit van die toetse is, wissel van .52 tot .89.

Omdat die voorlopige toetse aan 'n proses van itemontleding onderwerp is en die finale battery toetse met bykans 50% verleng is, kan verwag word dat die finale toetse heelwat hoër betroubaarheidskoeffisiënte as die voorlopige toetse sal toon. Geldigheidskoeffisiënte van die voorlopige toetse ten opsigte van eindeksamenprestasies is vir die vyf taalgroepe afsonderlik bereken. Beduidende koeffisiënte wat wissel tussen .200 en .646, is vir die voorlopige battery Skolastiese Aanlegtoetse gevind. Uit 'n totaal van 60 korrelasies was slegs een korrelasie van .184 nie beduidend nie. Die Taaltoetse en Rekenkundefoetse neig deurgaans om hoër met eindeksamenresultate te korreleer as die Verbale- en Nie-verbale Redeneringstoetse.

Besluit

Heelwat intensiewe navorsing moet nog gedoen word in verband met die ontwikkeling van sielkundige meetinstrumente ten

einde geskikte toetse vir die Bantoe daar te stel. Die benadering wat in hierdie ondersoek gevolg is, naamlik die aanpassing van bestaande toetstegnieke by die kulturele agtergrond van die Bantoe sal ongetwyfeld verder uitgebrei en verfyn moet word. Die resultate van hierdie ondersoek het veral aangetoon dat dit nie alleen die toetse en toetsinhoud is wat by die opvoedkundige peil en agtergrond van die Bantoe aangepas moet word nie, maar ook die hele toetsprosedure waaronder die toetsaanwysings seker die belangrikste is. Die sukses en vordering wat met hierdie aanpassing gemaak is, het volgens oordeel van die skrywer afdoende bewyse gelewer dat dit wel moontlik is om effektiewe hulpmiddels vir die Bantoe daar te stel om in die behoefte van keuring en opvoedkundige leiding te voorsien.