

सुस्वागतम्



आकाशभाकितेची आशयसूत्रे

प्रा . अनंता कस्तुरे

मराठी विभाग

प्रकरणाचे नाव

आकाशभाकितेची

आशयसूत्रे

प्रस्तावना

- मराठी विज्ञानसाहित्यातील सुबोध जावडेकर हे एक महत्त्वाचे कथाकार आहेत .
- विज्ञानकथा [कादंबरी हा साहित्याचा एक प्रकार आहे .
- विज्ञानामुळे घडून येणारे बदल आणि त्याचे मानवी जीवनावरील परिणाम याचे चित्रण विज्ञान साहित्यात येते .
- विज्ञान साहित्याचा केंद्रबिंदू माणूस हाच आहे .
- विज्ञानाचा थेट संबंध हा मानवी जीवनाशी येतो .

लेखक परिचय

- मराठी विज्ञान साहित्यातील आजचे आघाडीचे लेखक म्हणून सुबोध जावडेकरांना ओळखले जाते .
- सुबोध जावडेकरांचा जन्म 16 सप्टेंबर 1948 ला झाला .
- जावडेकरांनी कथा□कादंबरीबरोबर इतर विज्ञानविषयक लेखन केले आहे .
- कादंबरी लेखन

1 . आकांत□1988□

कथासंग्रह

- गुगली [1991] वामनाचे चौथे पाऊल [1994] संगणकाची सावली [1997] आकाशभाकिते [2003] कुरुक्षेत्र [2006] एकूण सहा कथासंग्रह आहेत .

इतर विज्ञानविषयक पुस्तके

- चिंतामणी हा नव्या युगाचा विज्ञानाच्या नव्या वाटा विज्ञानाची नवी क्षितिजे हसरं विज्ञान प्लॅस्टिकची मेजवानी इत्यादी .

पुरस्कार क्र सन्मान

- हसरं विज्ञान-गुगली आणि आकाशभाकिते या पुस्तकांसाठी त्यांना महाराष्ट्र राज्य साहित्य निर्माती उत्कृष्ट पुरस्कार .
- आकांत या कादंबरीला विज्ञानग्रथांली-कुरुक्षेत्रला केशवराव कोठावळे पुरस्कार प्राप्त .
- त्यांच्या या क्षेत्रातील योगदानासाठी महाराष्ट्र साहित्य परिषदेकडून गो . रा . परांजपे आणि पुणे मराठी ग्रंथालयाकडून स्वातंज्यवीर सावरकर इत्यादी पुरस्कार प्रदान .

आशयसूत्रे

- विज्ञानसाहित्यामध्ये विज्ञानकथा हा सर्वाधिक लिहिला जाणारा साहित्यप्रकार आहे .
- विज्ञान साहित्याची चर्चा विज्ञान कथेच्या आधाराने होताना दिसते . या कथांमध्ये येणारे विज्ञान हेच पारंपरिक कथेपेक्षा विज्ञान कथेला वेगळे ठरविते .
- हे विज्ञान बहुतांश वेळा उद्याचे शकेल अशी शक्यता असणारी संभाव्य विज्ञान असते . त्यामुळे हे कथासाहित्य अद्भुततेकडे झुकते .
- सुबोध जावडेकर यांनी विज्ञानाने निर्माण केलेले प्रश्न मानव कसे सोडवितो हे सांगणारी कथा लिहितात . त्यांच्या कथांमध्ये मानवी नाते संबंधाचा पीळ आहे .

विज्ञानाने निर्माण केलेले प्रश्न

- विज्ञान हे मानवाच्या कल्याणासाठी विकासासाठी अस्तित्वात आलेले आहे . या विज्ञानानेच मानवासमोर काही प्रश्न उपस्थित केले आहेत .
- 'तिसरा पर्याय' या कथेमध्ये राजेश हा तरूण या गर्तेत अडकतो . त्याला झालेल्या रोगावर उदया औषध उपचार निघतील म्हणून तो शीतनिद्रेत जाण्याचा निर्णय घेतो . त्याला पन्नास साठ वर्षांनंतर जागेकरण्यात आलेले असते . तेव्हा त्याच्या रोगावर उपचार होतो . पण त्याच्यासमोर नवेच प्रश्न निर्माण होतात . राजेशच्या काळातील पन्नास साठ वर्षे म्हणजे नव्या पिढीची शे दोनशे वर्षे असतात . तो शीतनिद्रेत असलेल्या वर्षामध्ये प्रचंड मोठी वैज्ञानिक प्रगती झालेली असते . या नव्या युगात आपला निभाव लागणार नाही याचे भान त्याला हॉस्पिटलमधील अनुभवांवरूनच येतो . राजेशला स्वतःचे आयुष्य निरर्थक वाटू लागते . नव्या युगाला सामोरे जाण्याचे सामर्थ्य त्याच्याजवळ नसते त्यामुळे तो स्वतःचे शरीर ट्युमरच्या संशोधनासाठी हॉस्पिटलला दान देण्याचे ठरवितो व विज्ञानाने निर्माण केलेल्या प्रश्नातून स्वतःची सुटका करून घेतो .

संभाव्य संशोधनाचे भाकित

- बहुतांश विज्ञानकथांमधून संभाव्य संशोधनाचे भाकित करण्यात आलेले असते .
सुबोध जावडेकर स्वतः माझी कथा विज्ञानापेक्षा मानसांवर केंद्रित झालेली असते असे म्हणतात. पण त्यांच्याही कथांमध्ये हे संभाव्य विज्ञान चित्रित होताना दिसते .
कथासंग्रहाचे 'आकाशभाकिते' हे शीर्षकही हेच सूचित करते .
- 'स्पर्शसुख' या कथेमध्ये आईच्या हातांचा ओलावा आणि स्पर्शसुख देणारे मालिशचे मशीन हेही उद्याच्या संभाव्य संशोधनाचे चित्र आहे .
- 'सौदा' या कथेमध्ये कोणत्यातरी परग्रहावर पृथ्वीवरील मानवापेक्षा शेकडो वर्ष पुढे प्रगत असलेल्या जीवसृष्टीचे भाकित येते .

विज्ञान आणि मानवी नातेसंबंध

- विज्ञान हे मानवाने स्वतःच्या जीवनसुखाकरिता शोधलेले आहे . वैज्ञानिक शोधामुळे मानवाच्या जीवनात अमुलाग्र रीती घडून आलेली आहे . शिक्षण, आरोग्य, प्रशासन, प्रसारमाध्यमे, उद्योग, व्यवसाय, प्रवास अशी सर्वच क्षेत्रे याची साक्ष देतात . दैनंदिन जीवनात विज्ञानाला फार मोठे स्थान आहे .
- 'आकाशभाकिते' कथासंग्रहातील 'हरवलेली बाहुली', 'पराधीन आहे जगती', 'कारगिलची अखेर' या कथांमधून सुबोध जावडेकरांनी हा मानवी नातेसंबंधाचा पीळ उलगडून दाखविला आहे .
- 'हरवलेली बाहुली' या कथेमध्ये मतीमंद मुलगी सोनाली ही संगणकाशी अधिक जुळते आणि तिचे नाते आईपेक्षा संगणकाशी अधिक असते . मानव व विज्ञान यांचे नातेसंबंध सूचित केले आहे .

विज्ञानामुळे घडून येणारे बदल आणि त्याचे परिणाम

- 'हरवलेली बाहुली' या पहिल्या कथेमध्ये मतीमंद मुलीशी चोवीस तास खेळू शकेल असे सॉफ्टवेअर तयार केले जाते . त्यामुळे संगणकासमोर बसून व्यायामाच्या अभावाने तिला होणारा आजार आणि त्या आजारात तिला येणारा मृत्यू हे विज्ञानाचे परिणाम आहेत .
- 'उषकाल' या कथेमध्ये क्लोनिंगमुळे अपत्याला जन्म दिल्यानंतर पुढचे महाभयानक परिणाम सहन करणारी तनुजा आणि तिची आई सुमेधा एक वेगळाच अनुभव देऊन जातो .

समारोप

- 'आकाशभाकिते' या कथासंग्रहात दहा विज्ञान कथा आहेत .
- सुबोध जावडेकरांनी या कथेत विज्ञानामुळे समाजात परिवर्तन घडून येते व त्याचा परिणामही होतो हे सूचित केले आहे .
- प्रस्तुत कथांच्या माध्यमातून एक प्रकारचे भाकित केलेले आहे .

संदर्भ ग्रंथ

- वामनाचे चौथे पाऊल □ सुबोध जावडेकर
- मराठी विज्ञानसाहित्य □ प्राचार्य म . सु . पगारे



सुस्वागतम्



रीटा वेलिणकर कादंबरीची भाषाशैली
प्रा . अनंता कस्तुरे
मराठी विभाग

प्रकरणाचे नाव

‘रीटा वेलिणकर’ या कादंबरीची भाषाशैली

प्रस्तावना

- कादंबरी हा बदलत्या समाजवास्तवाला सामोरे जाणारा लोकप्रिय वाङ्मयप्रकार आहे .
- सामाजिक भानातूनच कादंबरी निर्माण होते .
- शांता गोखले यांच्या 'रीटा वेलिणकर' या कादंबरीत खास अनुभवांचे दर्शन घडविणारे कथानक आणि प्रभावी आशयसूत्रे आलेली आहेत .
- रीटा ही कादंबरीची नायिका असून नायिकेचे जीवन सांगणारी व साधारण व्यक्तिकेंद्री असे या कादंबरीचे स्वरूप आहे .
- कादंबरीतील भाषा साधी □ सोपी □ जिव्हाळ्याची □ उपरोधिक □ परिणामकारक अशी आहे .

लेखिका परिचय

- शांता गोखले या आधुनिक काळातील मराठीतील श्रेष्ठ लेखिका म्हणून आळखल्या जातात .
- शांता गोखले यांचा जन्म 1481939 रोजी डहाणू येथे झाला .
- इंग्रजी भाषा आणि साहित्य घेऊन शांता गोखले यांनी ब्रिस्टॉल विद्यापीठातून पदवी प्राप्त केली .
- जवळजवळ 100 हून अधिक लेख तसेच पुस्तक व चित्रपट परीक्षण कविता नाटक असा एकूण त्यांचा लेखनप्रपंच आहे .
- 'अविनाश', 'स्ट्रीट प्ले' ही त्यांची महत्त्वपूर्ण प्रसिद्ध नाटके आहेत .
- 'फेमिना' आणि 'साप्ताहिक सकाळ' मधून त्यांचे लेख प्रसिद्ध .

कादंबरीची भाषा

- कादंबरी हा खूप मोठा भाषिक आवाका असलेला वाङ्मयप्रकार आहे . हा भाषिक आवाका रूढार्थाने गद्यमयच असतो .
- वाङ्मयप्रकारागणिक भाषा आपली रूपे बदलते .
- कादंबरी हा जीवनप्रवाहाबरोबर वाहात वाढत विकसित होत जाणारा वाङ्मयप्रकार आहे .
- जीवनातील अनेक घटना आणि सामान्यसांतील विविध प्रकारचे संबंध एकाच व्यक्तीच्या मनातील विचारांची गुंतागुंत ही कादंबरीच्या माध्यमातून चांगल्या प्रकारे व्यक्त होऊ शकते . यासाठी भाषा ही आशयसूत्राला अनुसरून वापरली जाते .
- कादंबरीत घटनाप्रसंगांची वर्णने मानवी मनातील भावनाची स्पंदने स्थळप्रदेशांची वर्णने ही भाषेद्वाराच केली जातात . यामुळे भाषेला आशयानुरूप वास्तव अतिवास्तव शैलींमध्ये लक्ष्यी अशी परिणामे प्राप्त करून घ्यावी लागतात .

स्त्रीवादी कादंबरी

- 'रीटा वेलिणकर' ही कादंबरी स्त्रीवादी कादंबरी म्हणून ओळखली जाते .
- कलाकृतीकडे पाहण्याचा स्त्री केंद्रीत दृष्टिकोन .
- स्त्रीचा म्हणून खास अनुभव असलेले ते स्त्रीवादी .

भाषाशैली

- कथानक, पात्रचित्रण, वातावरणनिर्माती या घटकांप्रमाणेच 'भाषा' हाही कादंबरीचा एक महत्त्वाचा घटक आहे .
- कादंबरीत निवेदनाची भाषा वेगळी व संवादाची भाषा वेगळी असते .
- आशयानुसार भाषा बदलत असते .
- 'रीटा वेलिणकर' या कादंबरीत प्रमाणभाषा वापरली असून इंग्रजी व हिंदी भाषेचाही अधून मधून वापर केला आहे .
- कादंबरीत तीन प्रकारची भाषा आलेली आहे
 - 1 . संवादाची भाषा
 - 2 . निवेदनाची भाषा
 - 3 . पत्रात्मक भाषा

संवादाची भाषा

- 'रीटा वेलिणकर' या कादंबरीमधील संवादामधून त्या त्या व्यक्तींचे स्वभावविशेष त्यामधून निर्माण होणारा संघर्ष लक्षात येतो .
- छोटया छोटया संवादातून बोलणाऱ्यांच्या मनाचे तसेच त्यांच्यातील परस्पर संबंधाचे दर्शन घडते .
- कादंबरीत संवादाची भाषा येते तेंव्हा इंग्रजी भाषेचा वापर जास्त केलेला दिसून येतो .
- कादंबरीत इंग्रजीबरोबर हिंदी भाषेचाही वापर केलेला आहे .

उदा . रीटा जेंव्हा हॉस्पिटलमध्ये अँडमीट असते तेंव्हा दूसरी पेशंट स्त्री व रीटाचा संवाद हिंदीतून आलेला दिसून येतो .

- कादंबरीत हिंदी व इंग्रजी भाषेचा वापर केलेला दिसून येतो .

निवेदनाची भाषा

- कादंबरीत निवेदनाची भाषा आलेली आहे .

उदा . “एकदा आपण प्रोफेशनल लाईफमध्ये एंटर केल की मदरटंग बोलण्याची प्रॅक्टिसच रहात नाही आणि एनीवे इंग्लिश केवढी रिच आहे . कलोक्वअल भाषा इंग्लिश मराठीपेक्षा किती ईझी वाटते बोलायला .” डॅडी आणि साळवी दोघांनाही इंग्रजी भाषाच सोपी वाटते . त्याबद्दल रीटाने केलेले हे निवेदन आहे .

पत्रात्मक भाषा

- कादंबरीत लखिकेने पत्रात्मक भाषेचा वापर केलेला आहे .
- पत्राची भाषा संवाद साधणारी व अनौपचारिक असते .
- शांता गोखले यांनी पत्ररूपी भाषेचा कौशल्याने वापर केला आहे .

उदा . कादंबरीची नायिका रीटाला नव्हर्स ब्रेकडाऊनचा अॅटॅक येतो आणि रीटा हॉस्पिटलमध्ये असते तेंव्हा रीटाने आपली मैत्रीन सरस्वतीला पत्रात्मक भाषा वापरली आहे .

खिश्चन शब्द

- कादंबरीत खिश्चन शब्द विपूल आलेले आहेत .

उदा . डॉली □ श्री □ रीटा □ शॅक्स □ जेली इत्यादी .

समारोप

- कादंबरीत संवादामध्ये इंग्रजीचा प्रभाव दिसून येतो व काही ठिकाणी हिंदी भाषा दिसून येते .
- कादंबरीत प्रमाण भाषेचा वापर केलेला आहे .
- कादंबरीतील भाषेतून महानगरीय जीवनाचे यथार्थ दर्शन घडते .
- ओघवती भाषा □मिताक्षरी शैली □जेमक्या शब्दात आशय मांडणारी व काव्यात्मतेकडे झुकणारी भाषाशैली .
- कादंबरीतील भाषा साधी □सोपी □जिव्हाळ्याची □उपरोधिक व परिणामकारक अशी आहे

संदर्भ ग्रंथ

- त्या वर्षी शांता गोखले
- गेल्या अर्धशतकातील मराठी कादंबरी संपा : विलास खोले .



आभारवाद!

मीनलबेन महेता कॉलेज, पाचगणी

प्रा. जे. आर. जाधव

भूमिका

- हिंदी उपन्यास का आरंभ लाला श्रीनिवासदास के 'परिक्षागुरु' 1843 से माना जाता है।
- उपन्यास के विकास क्रम में उपन्यास को प्रेमचंद पूर्व युग, प्रेमचंद युग, प्रेमचंदोत्तर युग के रूपों में विभक्त किया गया है।
- हर एक युग अपने-अपने समसामयिक परिवेश के अनुसार अपनी विशेषताओं को दर्शाता है।
- आज के आधुनिक साहित्यिक विधाओं में उपन्यास एक सशक्त एवं समृद्ध विधा के रूप में विकसित हुई है।
- उपन्यास में मानवी जीवन का ताना-बाना बुना जाता है।
- आज उपन्यास विधा के पाठक अन्य सभी विधाओं की तुलना में सर्वाधिक पाए जाते हैं, यही कारण है कि आधुनिक युग में उपन्यास साहित्य को अधिक महत्व प्राप्त हुआ है।
- उपन्यास विधा में युगबोध की क्षमता अधिक दिखाई देती है।
- उपन्यास का विषय-क्षेत्र विशाल एवं व्यापक होता है।
- उपन्यास में मनुष्य के वास्तविक जीवन को काल्पनिक ढंग से प्रवाहित किया जाता है।
- उपन्यास में मानवी जीवन के सत्य की अभिव्यक्ति होती है।
- आधुनिक काल का उपन्यास सामाजिक यथार्थता का दर्पण है।
- उपन्यास आधुनिक समाज में अभिव्यक्त समस्याओं से टकराता है, जुझता है और समाधान भी करता है।

रजनी गुप्त के साहित्य का परिचय

उपन्यास साहित्य

- कहीं कुछ और
- किशोरी का आसमां
- एक न एक दिन
- कुल जमा बीस
- ये आम रास्ता नहीं
- कितने कठघरे

कहानी संग्रह

- एक नई सुबह
- हाट बाजार
- प्रेम संबंधो की कहानियाँ
- अस्ताचल की धूप (सर्जना पुरस्कार)
- फिर वहीं से शुरू

स्त्री विमर्श

- सुनो तो सही (आलोचनात्मक पुस्तक)

संपादन

- आजाद औरते कितनी आजाद
- मुस्कराती औरते
- आखिर क्यों लिखती हैं स्त्रियाँ

कथाक्रम

- साहित्यिक पत्रिका में संपादकीय सहयोग

विषय की नविनता

- नई शर्ती के एक सशक्त उपन्यासकार के रूप में हिंदी साहित्य जगत में रजनी गुप्त को नवाज़ा जाता है।
- रजनी गुप्त ने अपने साहित्य में युवा वर्ग का यथार्थ चित्रण किया है।
- युवा वर्ग समाज का एक महत्वपूर्ण अंग है।
- उपन्यासों में अभिव्यक्त युवा वर्ग की समस्याओं का विवेचन करना है।
- युवा वर्ग में बढ़ता असंतोष, विवेक, संकल्प, दृष्टी, संयम के आभाव में दौड़ लगाते युवा वर्ग को प्रेरणा देना तथा उन्हें सही राह दिखाना है।
- उपन्यासों में अभिव्यक्त युवा पात्रों द्वारा समाज में उपलब्ध मानवी मानसिकता को प्रस्तुत करना है।
- समसामायिक परिवेश में जुड़ते युवा वर्ग का मौलिक चित्रण करना।
- युवा वर्ग की समस्याओं को अभिव्यक्त करना तथा समस्या सुलझाने की कोशिश करना।

विषय का महत्व

- इस शोध कार्य का प्रमुख लक्ष्य समाज के सच्चे रूप को तथा उसमें छुपी सच्चाई को अभिव्यक्त करना है।
- समसामयिक परिवेश में युवा वर्ग की दशा और दिशा को अभिव्यक्त करना है।
- रजनी गुप्त का समकालीन उपन्यास साहित्य आज के युग की एक बहुत बड़ी उपलब्धि है।
- प्रस्तुत उपन्यासों के माध्यम से सामाजिक, आर्थिक, राजनीतिक, भ्रष्टाचार, बेरोजगारी, भूमंडलीकरण, इंटरनेट, मल्टीमिडिया, पश्च्यात संस्कृति का अविर्भाव, अनैतिकता, पारिवारिक समस्या, उपभोगवादिता आदि सभी समस्याओं पर प्रकाश डालना है।
- प्रस्तुत शोध कार्य युवा वर्ग को एक नई दिशा देनेवाला है।
- प्रस्तुत शोध कार्य समाज उपलब्ध कुंठाग्रस्त आसक्तियों को उजागर करनेवाला है।

धन्यवाद

सुस्वागतम्



भाषाविज्ञान

प्रा . नरेंद्र फडतरे

हिंदी विभाग

श्रीमती मीनलबेन महेता कॉलेज प्राचगणी

प्रस्तावना

- विज्ञान का उद्देश अपने विषय का संपूर्ण ज्ञान कराना है □ इसलिए अध्ययन की दृष्टिसे विज्ञान के कई विभाग किये जाते हैं □ विषय का यह विभाजन विषय को ठीक रीती से आकलन करने में सहायक होता है □ साथ ही जीवन और जगत की सिद्धान्तों का भी अध्ययन होता है □ ज्ञान की कोई सीमा नहीं है □ उसका विभाज नहीं किया जा सकता □ अध्ययन की सुविधा के लिए हम उसे अलग अलग नाम देते हैं □

भाषा विज्ञान के प्रधान अंग

- ध्वनिविज्ञान
- पदविज्ञान □ रूपविज्ञान
- वाक्य विज्ञान
- अर्थ विज्ञान
- इसके अतिरिक्त डॉ . भोलानाथ तिवारी ने भाषा विज्ञान के और दो अंग बताए हैं □
- शब्द विज्ञान
- प्रोक्तिविज्ञान

ध्वनिविज्ञान (Phonetics)

- भाषा के अंदर ध्वनि का बहुत महत्त्व है □
- ध्वनि भाषा की लघुत्तम इकाई है □
- ध्वनिसमूह से भाषा का निर्माण होता है □
- ध्वनियों के साथ-साथ इनके उच्चारण स्थान का भी अध्ययन ध्वनिविज्ञान के अंतर्गत होता है □
- वाग्यंत्र के कई अंग होते हैं □ जिनसे विभिन्न ध्वनियों का उच्चारण होता है □
जैसे □ ओष्ठ अंग से 'प' वर्ग की ध्वनियों का □ कंठ अंग से 'क' वर्ग की ध्वनियों का उच्चारण होता है □

पदविज्ञान (Morphology)

- पदविज्ञान को रूप विचार या पद रचना शास्त्र भी कहते हैं □
- सार्थ वाक्यों के समुच्चय से भाषा का निर्माण होता है □
- 'पद' शब्द का सीधा अर्थ है पैर □ पैर का काम है चलना □
- जब मूल शब्द में प्रत्यय □ विभक्ती आदी के योग से विकार उत्पन्न हो जाता है □ तब उसे पद कहा जाता है □ उदाहरण के लिए □ 'राम', 'रावण', 'बाण', 'मारा' इन चार शब्दों को ले सकते हैं □
- अर्थ तत्त्व संबंध तथा तत्त्व के योग से बना शब्द 'पद' कहलाता है

वाक्य विज्ञान (syntax)

- भाषा का सबसे महत्वपूर्ण अंग वाक्य है □
- भाषा का कार्य विचार □ नियम है □ जिसका माध्यम वाक्य है □
- 'वाक्य विज्ञान' को 'वाक्य विचार' भी कहा जाता है □
- विविध पदों से वाक्य का निर्माण होता है □
- वाक्य सार्थक होता है और सार्थक वाक्यों से भाषा की रचना होती है □
- वाक्य में जिसके विषय में कुछ कहा जाता है □ उसे उद्देश कहते हैं और उद्देश के बारे में जो कुछ कहा जाता है □ उसे विधेय कहते हैं □
जैसे □ 'राम पुस्तक पढ़ता है' □

अर्थ विज्ञान (semantics)

- अर्थ भाषा का आंतरिक पक्ष है जिसे 'आत्मा' की संज्ञा दी जाती है □
- भाषा की सार्थक व्यवस्था अर्थ के द्वारा ही संभव है □
- संप्रेषणीयता भाषा की सर्वाधिक महत्त्वपूर्ण आवश्यकता है □
- ध्वनि वाक्यरूप और शब्द भाषा के शरीर है तो 'अर्थ' आत्मा है □
- अर्थ विज्ञान को 'अर्थ -विचार' और 'अर्थ उद्बोधशास्त्र' कहा जाता है □

शब्द विज्ञान (Wordalogy)

- शब्दों का वर्गीकरण किसी भाषा के शब्द समूह में परिवर्तन के कारण एवं दिशाएँ □ शब्द समूह □ कोश विज्ञान और व्युत्पत्तिशास्त्र इसी विभाग के अंग हैं □
- व्युत्पत्तियों के अध्ययन के समय शब्दों का तुलनात्मक एवं ऐतिहासिक अध्ययन किया जाता है □

प्रोक्ति विज्ञान (Discoursoiogy)

- किसी बात को कहने के लिए प्रयुक्त वाक्यों के समुच्चय को 'प्रोक्ति' कहते हैं□
- अंग्रेजी शब्द 'डिस्कॉर्स' के लिए प्रति शब्द के रूप में हिंदी में 'प्रोक्ति' शब्द का प्रयोग हो रहा है□
- भारतीय काव्यशास्त्री प्रोक्ति के लिए 'महावाक्य' का प्रयोग प्राचीन काल में करते थे□
- समाज में विचार विनिमय के लिए प्रोक्ति का प्रयोग किया जाता है□




आपका स्वागत!

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Introduction to the Novel

What is a novel?

- ▶ **Characteristics:**
 - ▶ a fictional prose work
 - ▶ usually divided into chapters
 - ▶ relatively long and often complex plot
 - ▶ story traditionally develops through the thoughts and actions of its characters
- 

First person point of view

- ▶ This means that the narrator –is a character in the story
- ▶ describes the action in his or her own words What's shown is limited to the character's observations and thoughts


Third person point of view

Events and characters described
by a character outside the action


Third person limited point of view:

- ▶ The narrator tells the story from the perspective of only one character.
- ▶ The reader only learns what this person feels and experiences

Development of character

- ▶ **Main characters** - characters who the story revolves around the most.
 - ▶ **Minor characters** - interact with the main characters and help move the story along.
 - ▶ **Static characters** - stay the same over the entire course of the story, even though their situation may change.
 - ▶ **Dynamic characters** - evolve as individuals, learning from their experiences and growing emotionally.
- 

Plot Definition

- ▶ Plot is the organized pattern or sequence of events that make up a story. Every plot is made up of a series of incidents that are related to one another
 - ▶ The plot is the sequence of events or what happens in a story.
 - ▶ Many plots contain a central problem – something that goes wrong.
- 

Parts of a plot

Plots usually progress through stages:

- Exposition
 - Rising Action
 - Climax
 - Falling Action
- Resolution

THANKING YOU



WELL-COME

Literary Criticism & Critical Appreciation

PLATO`S THEORY OF IMITATION

Mr.J.V. Shinde

Ass. Prof. English

SMT. Meenalben Mehta College, Panchgani

The Mining Of Imitation

- *His theory of Imitation is one of the most discussed concepts in Literary Criticism. 'Imitation' is the translation of the Greek word mimesis. It was first used by Plato in his book 'The Republic'*

Plato`s Theory Of Imitation

- *Plato was of view that all the fine art are imitative.*
- *Plato considered poetry to be imitative.*
- *He claimed the poetry is unreal and away from reality.*
- *Plato gave example of bed.*

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ECONOMICS PAPER -IX

● B A- III

● **HISTORY OF ECONOMICS
THOUGHT**

● **Prof. S.P.Kudale**

(Head of Department, Economics)

HISTORY OF ECONOMICS THOUGHT

Define the history of Economics Thought and compare it with Economic History of Economics

Definition

- “The History of Economics Thought, then is an essential part of general history both explaining it and being explained by it”

Introduction

- ◎ The man is the only creature in the world who is rational and thoughtful. Thoughts of human being may be of two types- problem- oriented and knowledge-oriented. The genesis and the development of many human sciences and have been problem biased. such as sociology , political science and economics. secondly there are other sciences, like philosophy and astronomy which may be called knowledge oriented and have been developed for the satisfaction of ones desire of gaining knowledge.it is with this view that plato called philosophy as the Child of wonder.....Pigou called this classification of sciences gradually fruit bearing science and light bearing science.

Unit -I

- ◎ Definition and Scope of History of Economic Thought.

- ◎ ***Part-I***

Ancient and Medieval Economic Thought

- *Ancient Economic Thought*
- *.... The Hebrews , The Greeks and the Romans*
- *Medieval Economic Thought*
- *...*

- ① Part-II
- ① Dr. Marshals Theory
- ① Prof. Keyns Theory

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- ◉ **DEPARTMENT OF ECONOMICS**

⦿ B com- I

⦿ **MICRO ECONOMICS**

⦿ **Prof. Dr. T.M. Rabade**

(Asst. Professor)

MICRO ECONOMICS

Economics is a social science. Paul A. Samuelson, a Nobel Laureate Economist, regards Economics as queen of Social Sciences. Economics as Social Science has been variously defined.

Uses of Microeconomic Theories

- ⦿ Microeconomic theory explains the behaviour of various individual elements of of body economic and brings out the nature of interrelationship and interdependence between them.
- ⦿ Microeconomic theories establish cause-and-effect

Introduction

- ◎ The man is the only creature in the world who is rational and thoughtful. Thoughts of human being may be of two types- problem- oriented and knowledge-oriented. The genesis and the development of many human sciences and have been problem biased. such as sociology , political science and economics. secondly there are other sciences, like philosophy and astronomy which may be called knowledge oriented and have been developed for the satisfaction of ones desire of gaining knowledge.it is with this view that plato called philosophy as the Child of wonder.....Pigou called this classification of sciences gradually fruit bearing science and light bearing science.

Unit -I

- ◎ Definition and Scope of History of Economic Thought.

- ◎ ***Part-I***

Ancient and Medieval Economic Thought

- *Ancient Economic Thought*
- *.... The Hebrews , The Greeks and the Romans*
- *Medieval Economic Thought*
- *...*

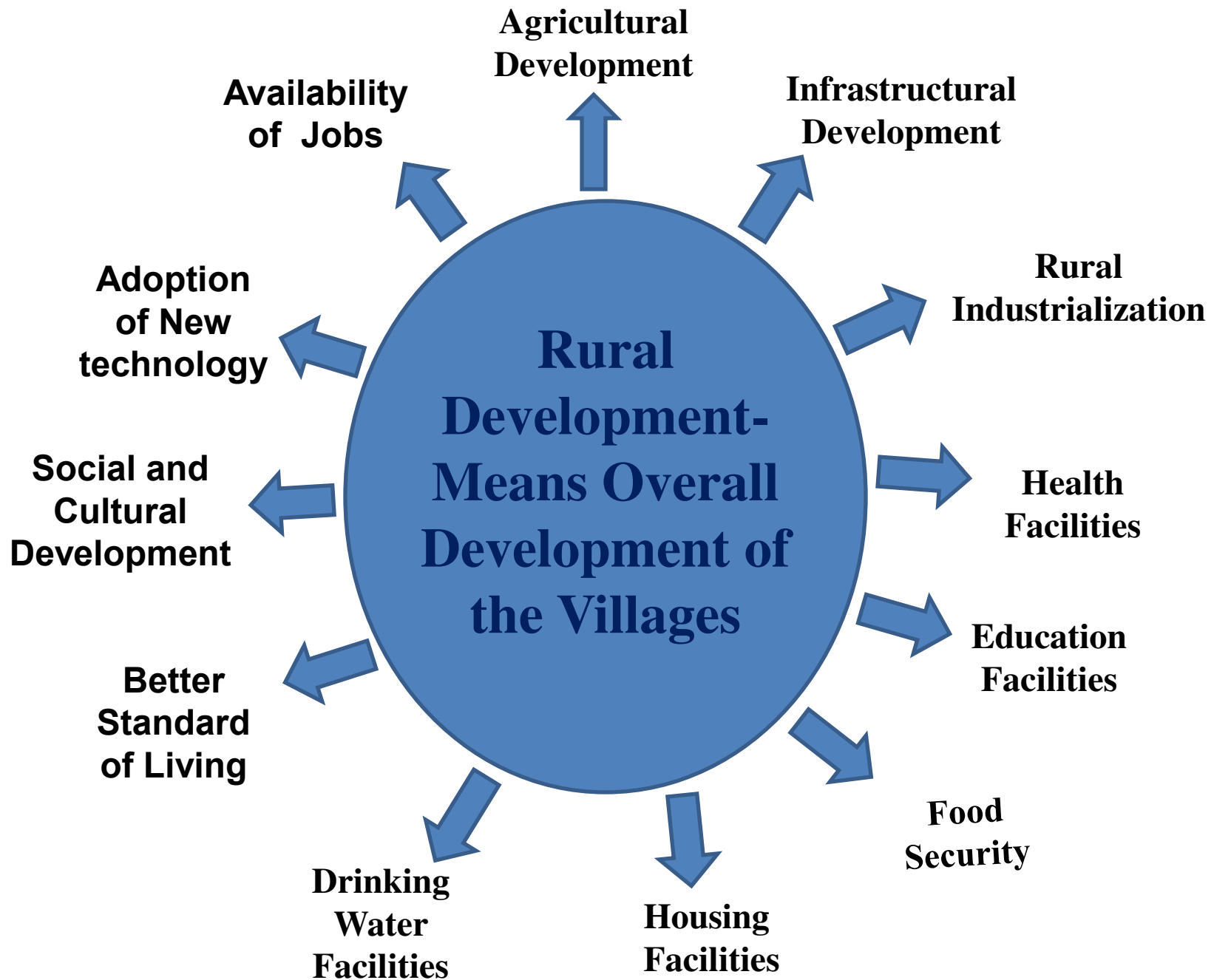
श्रीमती मीनलबेन महेता कॉलेज पाचगणी

श्री. राजाराम मारूती कांबळे

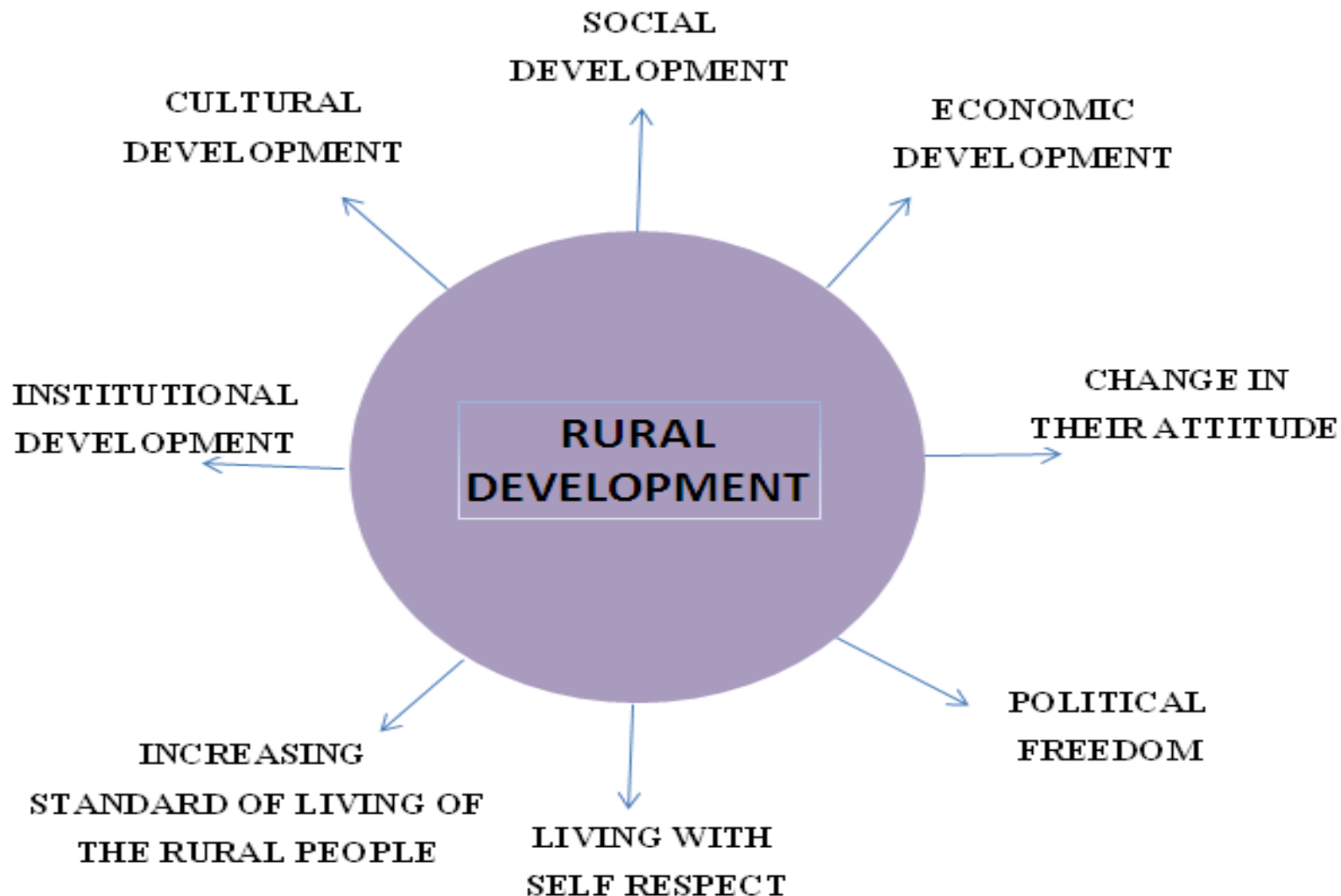
अर्थशास्त्र विभाग

Rural Development

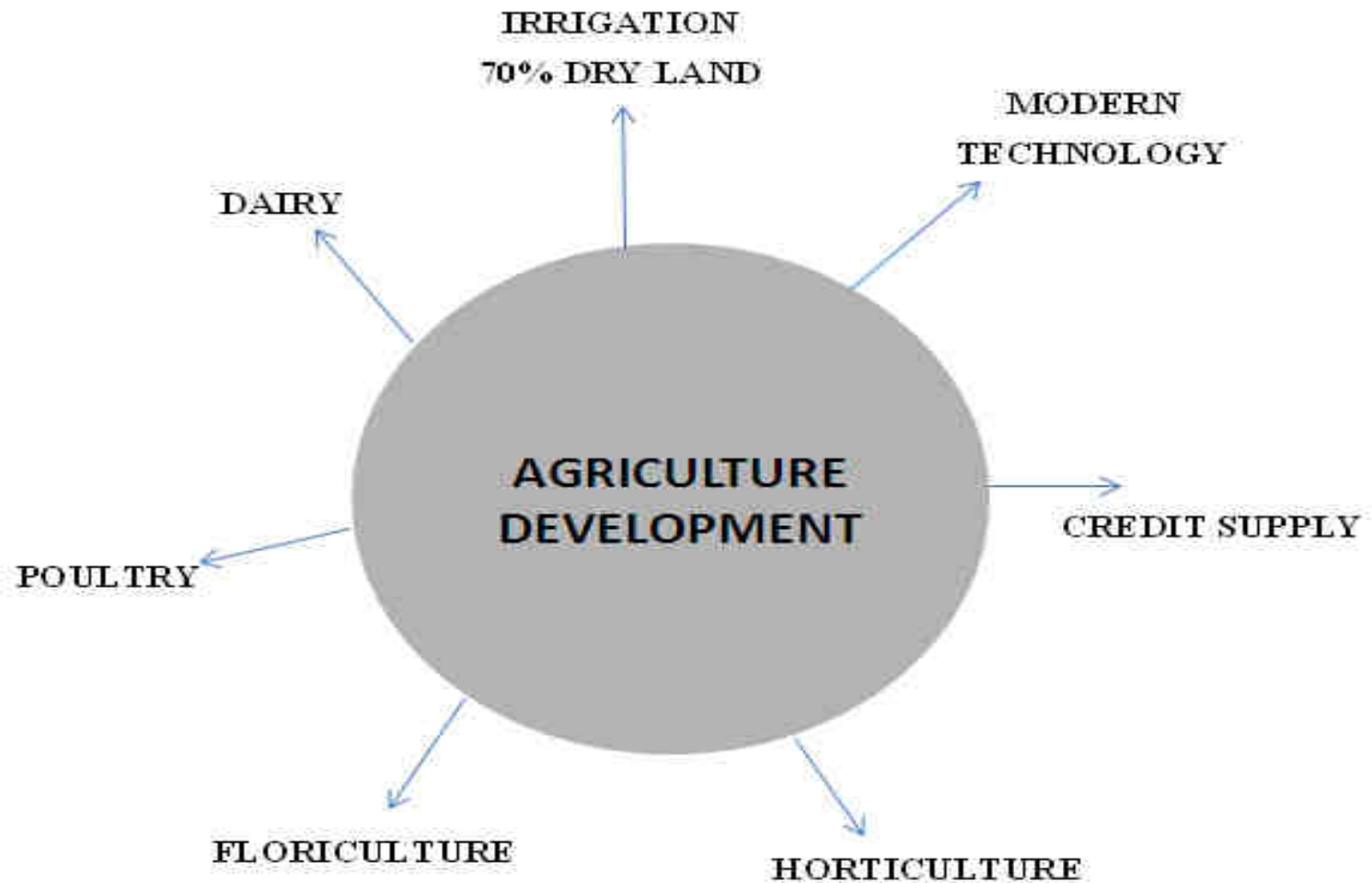




RURAL DEVELOPMENT: OVERALL DEVELOPMENT OF THE RURAL AREAS



AGRICULTURE DEVELOPMENT



Rural Credit Cooperatives in India

Demand For Short and Long Term Rural Credit

- 1) National Bank for Agriculture and Rural Development (NABARD)**
- 2) Co-operative Credit Structure (CCS)**
- 3) State Cooperative Banks (SCB)**
- 4) District Central Cooperative Banks (DCCB)**
- 5) Primary Agricultural Credit Societies (PACS)**
- 6) Primary Cooperative Agriculture and Rural Development Banks (PCARDB)**





INFRASTRUCTURE

RURAL ROADS



IRRIGATION



INFRASTRUCTURE

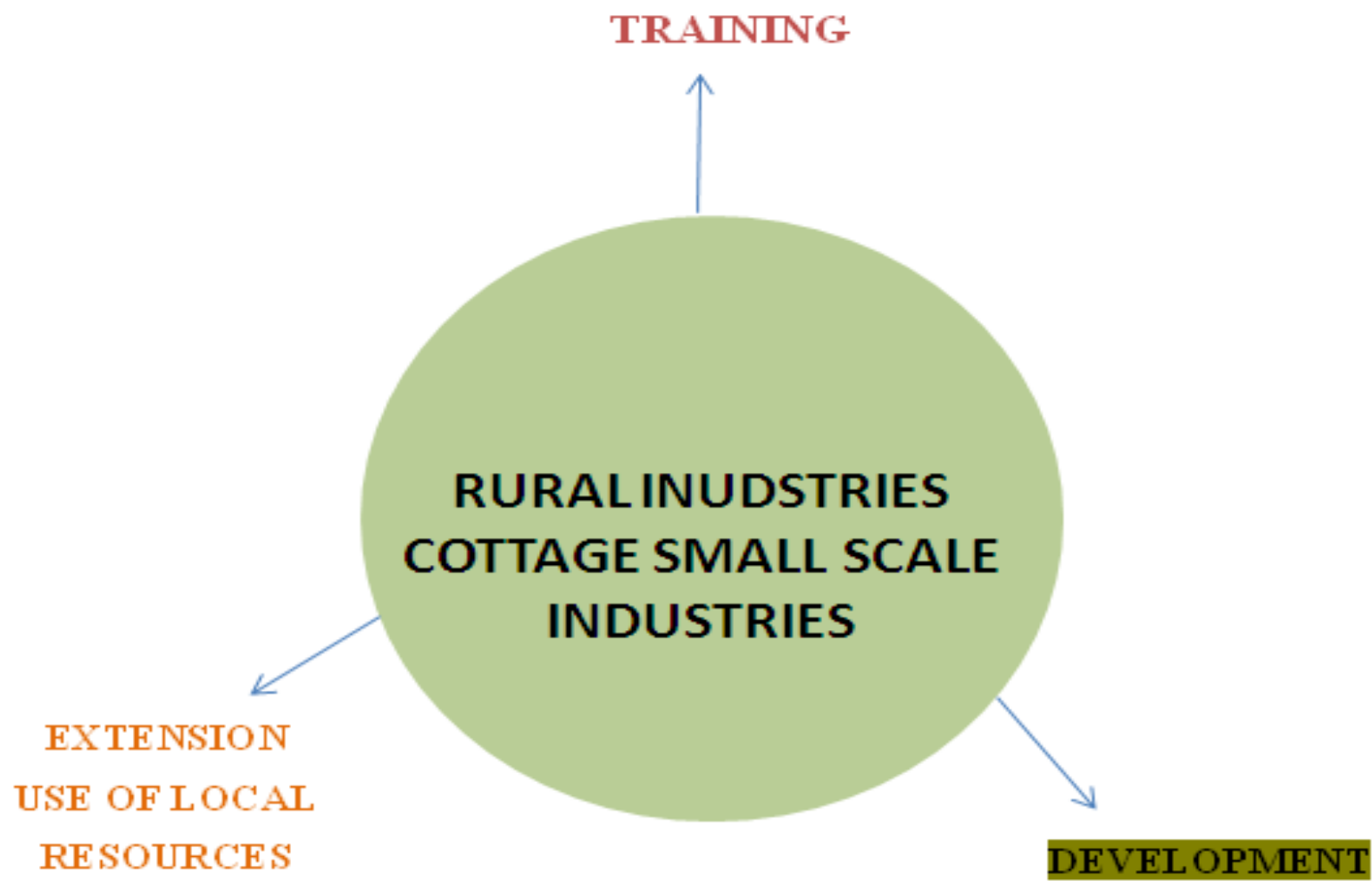


ELECTRICITY



TRANSPORT AND
COMMUNICATION

RURAL INDUSTRIES: COTTAGE SMALL SCALE INDUSTRIES



Cottage small industries



SOCIAL SERVICES

HEALTH

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graph TD; A((SOCIAL SERVICES)) --> B[HEALTH]; A --> C[EDUCATION]; A --> D[ENTERTAINMENT CULTURAL PROGRAMME];
```

SOCIAL SERVICES

**ENTERTAINMENT
CULTURAL
PROGRAMME**

EDUCATION

Health services

Rural

Urban



Education situation

Rural

Urban



HUMAN RESOURCES

EDUCATION



TRAINING



HUMAN RESOURCES



INCREASE IN
PRODUCTIVITY



INCREASE IN
EFFICIENCY



RURAL DEVELOPMENT



Percentage of Rural Population in India

Year	Urban	Rural
1951	17%	83%
1961	18%	82%
1971	20%	80%
1981	24%	76%
1991	26%	74%
2001	28%	72%
2011 (P)	31%	68.85%

Issues In Rural Development

POPULATION



**TO BE REDUCED
PROGRESSIVELY**

ALCOHOLISM



**STRICT ENFORCEMENT OF
PROHIBITION**

**LAND
HOLDINGS**



**CONSOLIDATION INTO VIABLE
UNITS OR COOPERATIVE
FARMING**

AGRICULTURE



**PRODUCTIVITY TO BE
INCREASED – FOOD/NON-FOOD**

EDUCATION



**TO BE INCREASED
SUBSTANTIALLY
(MEN & WOMEN)**

EMPLOYMENT



OPPORTUNITIES TO BE INCREASED

CASTEISM



TO BE ABOLISHED

EXPLOITATION



MUST BE MINISISED

**TRAFICKING IN
WOMEN &
CHILDREN**

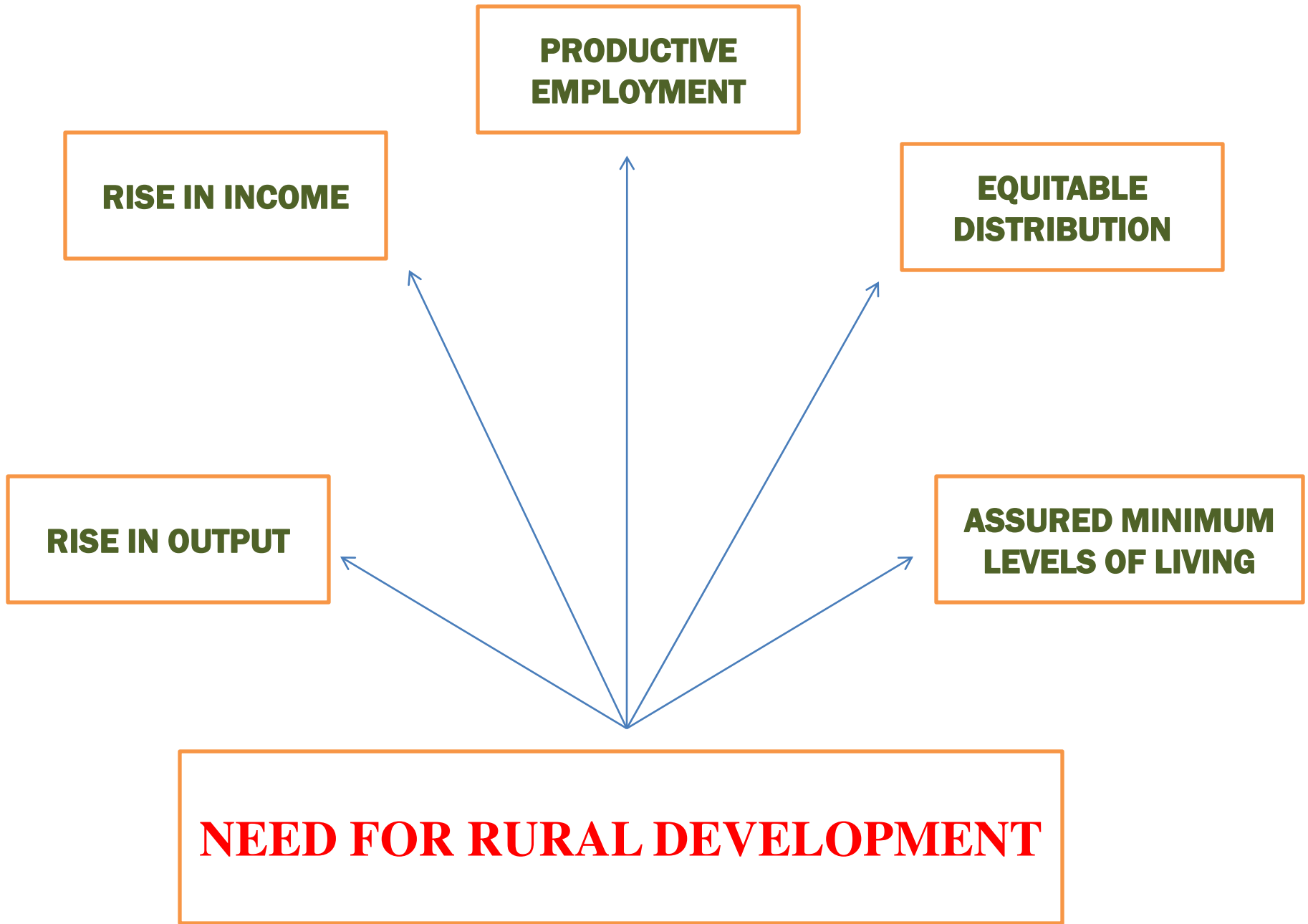


TO BE PROHIBITED

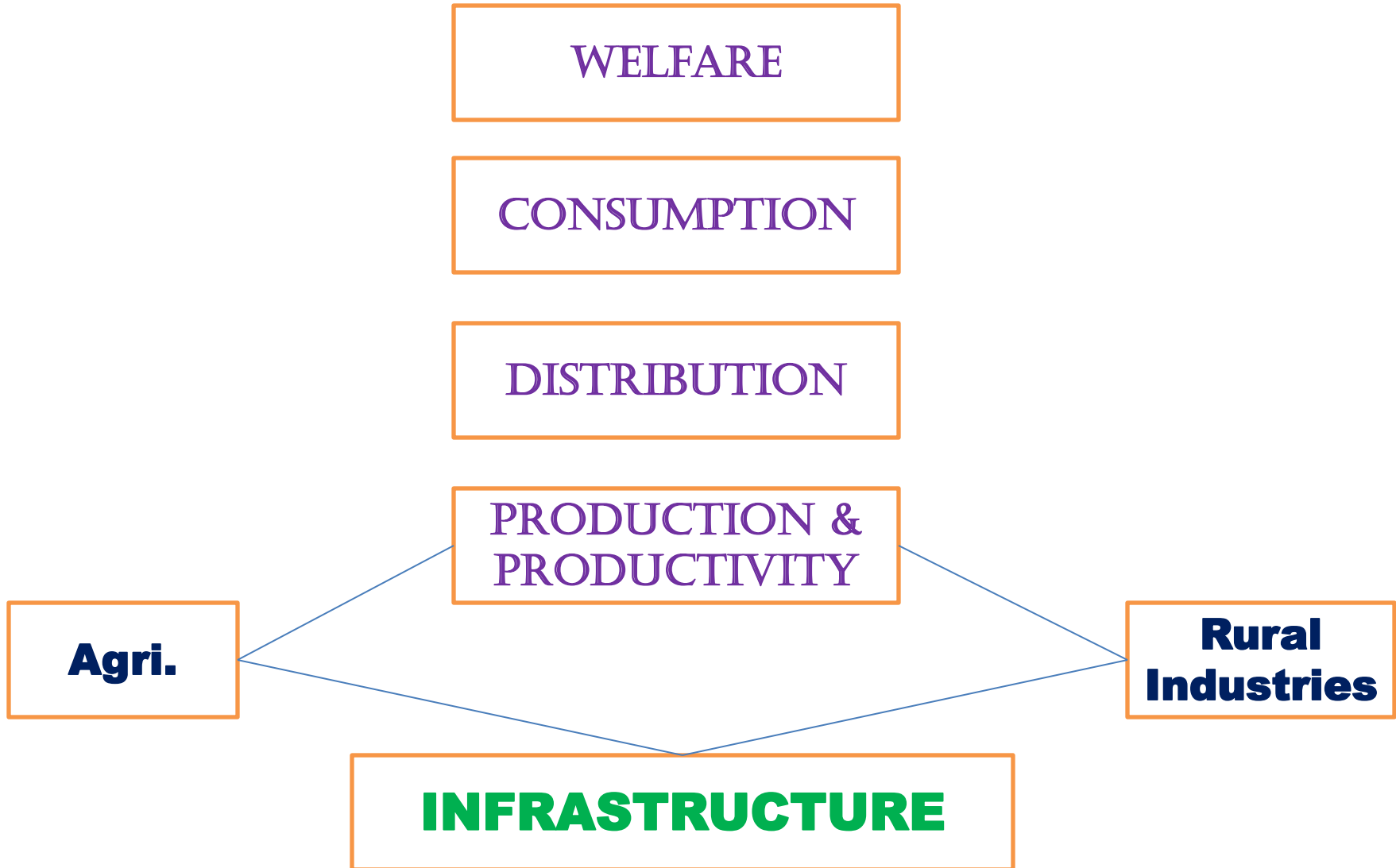
LEADERSHIP



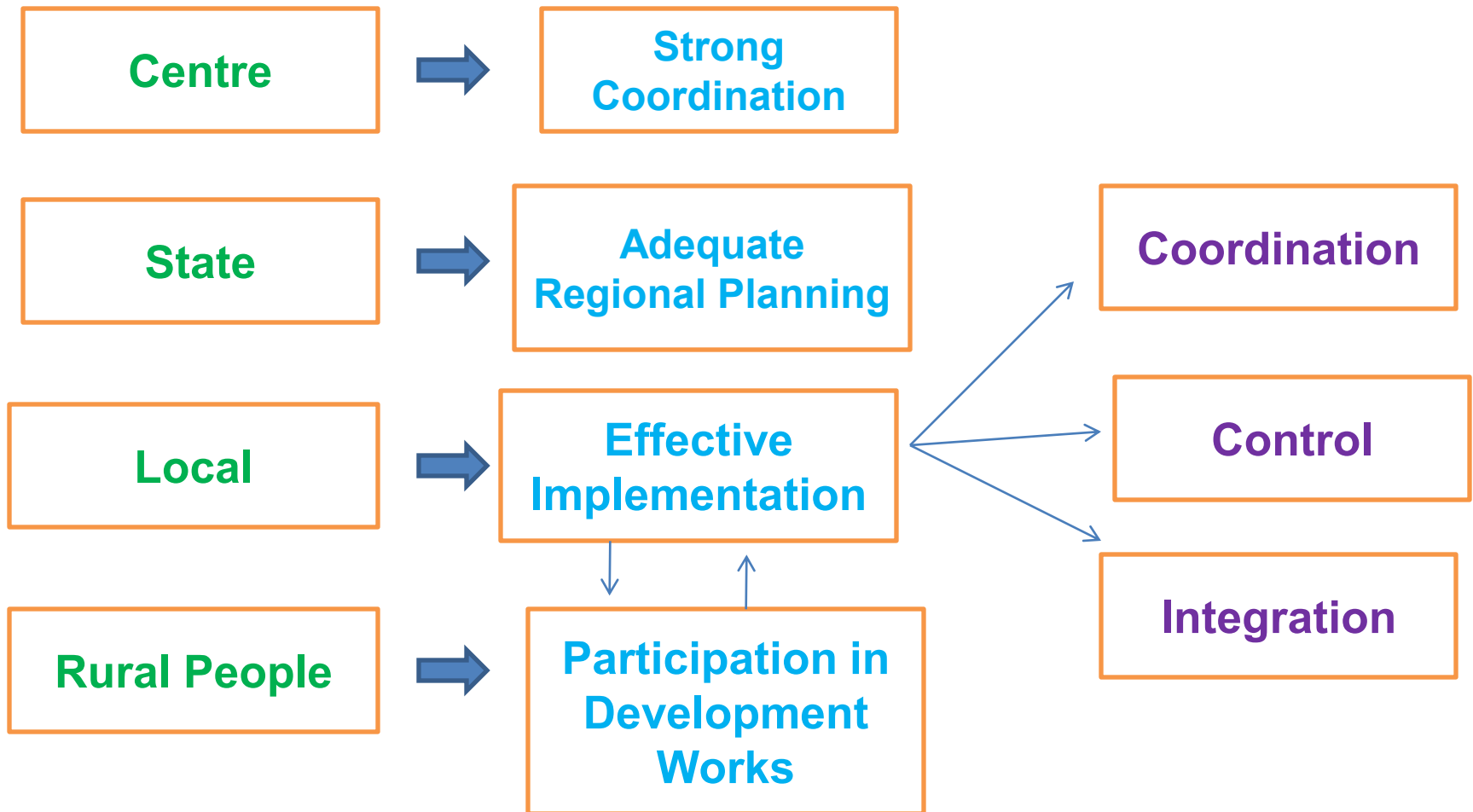
INNOVATIVE AND MOTIVATING



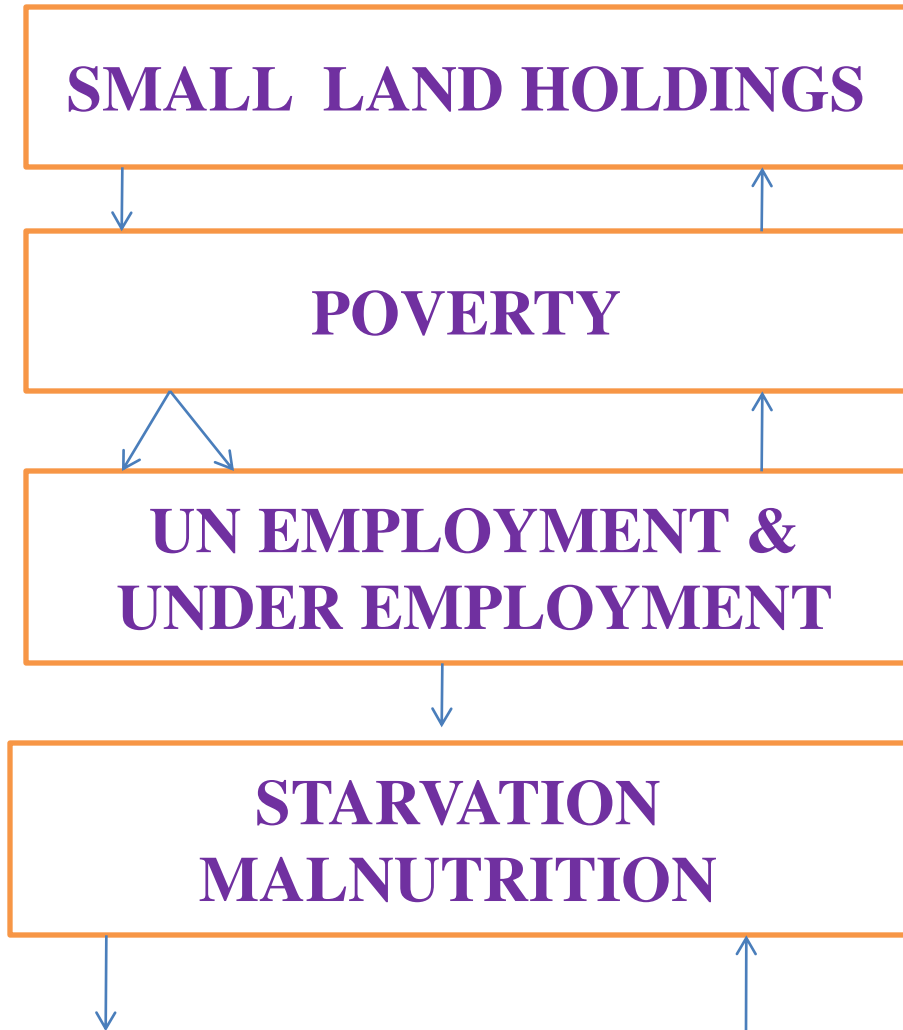
Process of Rural Development



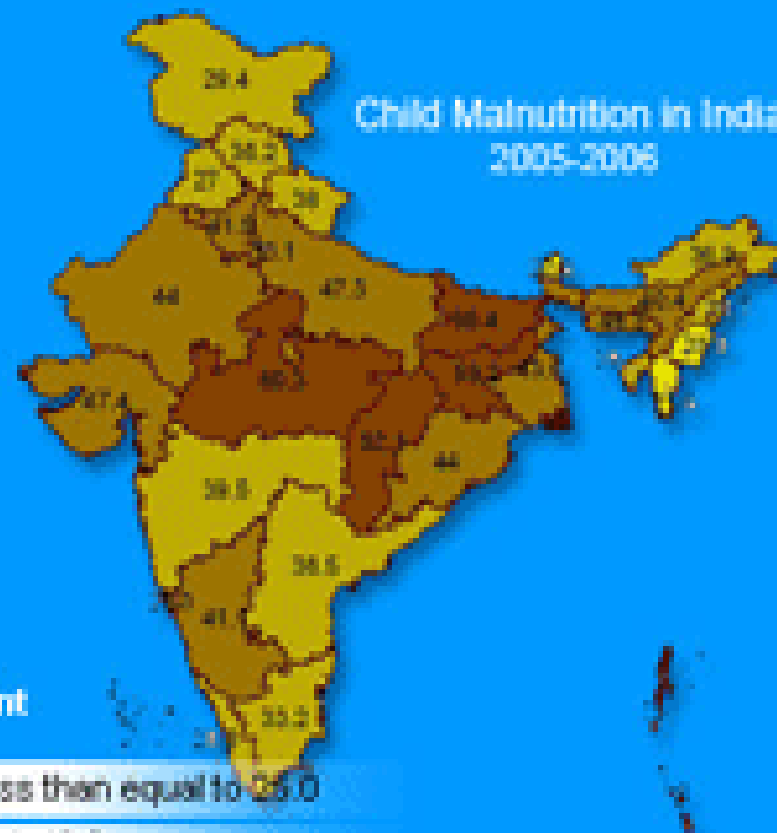
Organization for Rural Development



BARRIERS TO SOCIO - ECONOMIC DEVELOPMENT IN RURAL AREAS



Spotlight on UNICEF focus districts



Percent

	Less than equal to 25.0	
	25.1-40.0	
	40.1-50.0	Urban 36.4
	More Than 50.0	Rural 49.0
	Missing Value	

ILL - HEALTH



ILLITERACY



IGNORANCE



IDLENESS



CASTE



**EXPLOITATION BY
VESTED INTERESTS**

Rural Poverty

S.D.Tendulkar Committee

MPCE-Monthly Per Capita Consumption
Expenditure

Rural Area- Rs.673

Urban-Rs.860

Year2009-10

Rural Poverty Population(BPL)

2004-05-41.08%

2009-10-33.08%

ROLE OF THE GOVERNMENT IN RURAL DEVELOPMENT

GOVERNMENT

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graph TD; GOVERNMENT[GOVERNMENT] --> AGRICULTURE[AGRICULTURE]; GOVERNMENT --> RURAL_INDUSTRY[RURAL INDUSTRY]; GOVERNMENT --> AREA_DEVELOPMENT[AREA DEVELOPMENT]; GOVERNMENT --> EMPLOYMENT[EMPLOYMENT]; GOVERNMENT --> SPECTAL_PROGRAMMES[SPECTAL PROGRAMMES (WELFARE)];
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AGRICULTURE

**RURAL
INDUSTRY**

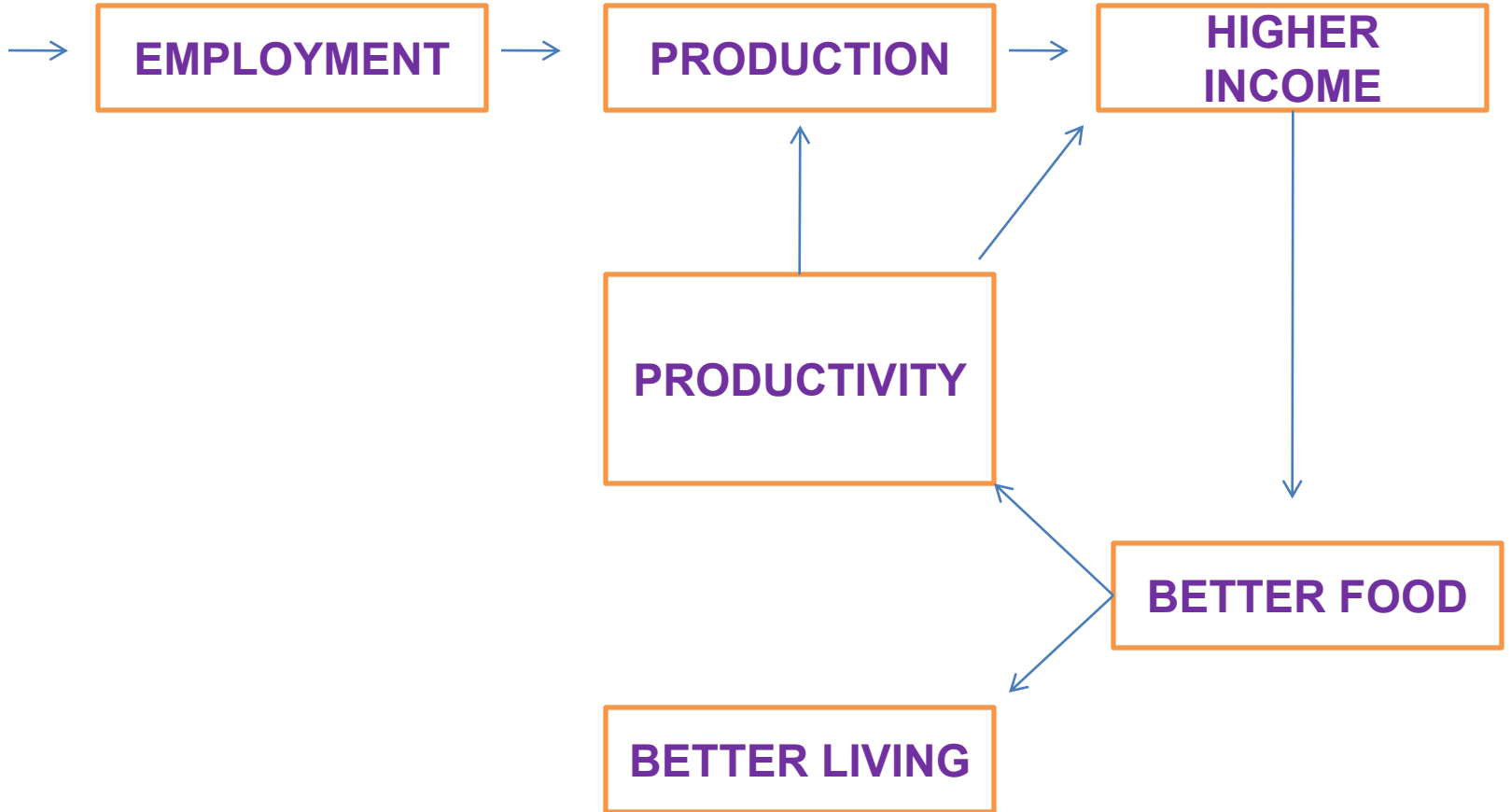
**AREA
DEVELOPMENT**

EMPLOYMENT

**SPECTAL
PROGRAMMES
(WELFARE)**

**R
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P
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O
R**



Ministry of Rural Development

PLAN

(Rs. in crores)

	Name of Department	2013-14 B.E.
A	Rural Development	74429.00
B	Land Resources	5765.00
	TOTAL :	80194.00

Department of Rural Development **A**

Sl. No	Name of the Scheme	2013-14
1	Mahatma Gandhi National Rural Employment Guarantee Scheme	33000.00
2	Ajeevika- National Rural Livelihood Mission	4000.00
3	DRDA Administration	250.00
4	Rural Housing	15184.00
5	Pradhan Mantri Gram Sadak Yojana	21700.00
6	Grants to National Institute of Rural Dev	50.00
7	Assistance to C.A.P.A.R.T.	15.00
8	PURA	50.00
9	Management support to RD Programmes and Strengthening District Planning Process	150.00
10	BPL Survey	60.00
Total :		74429.00

Department of Land Resources

B

PLAN

(Rs. in crores)

SI No.	Name of the Scheme	2013-14
		B.E.
1	Integrated Watershed Management Programme	5387.00
2	National Land Records Modernisation Programme	377.00
3	Bio-fuel	0.00
4	National Rehabilitation & Resettlement Policy	0.50
	Total :	5765.00

Department of Drinking Water & Sanitation **C**

Sr.No.	Name of the Scheme Plan (B. E.) Rs. In	2011-12	2012-13	2013-14
1	Rural Water Supply and Sanitation Programme	11000	13000	15260



Programmes & Policies For Rural Development

- 1. National Rural Employment Guarantee Act (NREGA)**
- 2. Swarnjayanti Gram Swarozgar Yojana (SGSY)**
- 3. Pradhan Mantri Gram Sadak Yojana (PMGSY)**
- 4. Indira Awaas Yojana (IAY)**
- 5. National Social Assistance Programme (NSAP)**
- 6. Provision of Urban Amenities In Rural Areas (PURA)**
- 7. District Rural Development Agency (DRDA)**
- 8. Rural Development Activities in North Eastern Region**

- 9. Empowerment of Women**
- 10. Scheduled Caste Sub-plan And Tribal Sub-plan**
- 11. Disability Sector**
- 12. CAPART**
- 13. Training**
- 14. Information, Education & Communication**
- 15. International Cooperation**
- 16. E- Governance Activities**
- 17. Monitoring And Evaluation**
- 18. Organisation**

1

National Rural Employment Guarantee Act (NREGA)

It was introduced in 200 districts in the financial year (FY) 2006-07 and additional 130 districts in FY 2007-08, and extended to rest of the country from FY 2008-09.



“A nation’s culture resides in the hearts and in the soul of its people.”

Mahatma Gandhi



Water Conservation

Swarnjayanti Gram Swarozgar Yojana (SGSY)

The Swarnjayanti Gram Swarozgar Yojana (SGSY) is a major programme for the self-employment of rural poor. It was started from 01.04.1999 after restructuring the erstwhile Integrated Rural Development Programme (IRDP) and its allied programmes, namely Training of Rural Youth for Self Employment (TRYSEM), Development of Women and Children in Rural Areas (DWCRA), Supply of Toolkits in Rural Areas (SITRA) and Ganga Kalyan Yojana (GKY), besides Million Wells Scheme (MWS).

The basic objective of the SGSY is to vbring the assisted poor families (Swarozgaris) above the Poverty Line by providing them income-generating assets through a mix of bank credit and governmental subsidy. The programme aims at establishing a large number of micro enterprises in rural areas based on the ability of the poor and potential of each area. The brief details of the programme is indicated in overleaf.



A stall marketing products made by SHGs

Pradhan Mantri Gram Sadak Yojana (PMGSY)

Pradhan Mantri Gram Sadak Yojana (PMGSY) was launched on 25th December 2000 by the Government of India as a 100% Centrally Sponsored Scheme to provide road connectivity in rural areas of the country. The programme envisages connecting all habitations with a population of 500 persons and above (250 persons and above in respect of hill States, the tribal and the desert areas) through good all weather roads.



A road built in Assam under the PMGSY programme

India Awaas Yojana (IAY)

The India Awaas Yojana (IAY) is a flagship scheme of the Ministry of Rural Development to provide houses to the Below Poverty Line (BPL) families in the rural areas. It has been in operation since 1985-86. The funding of IAY is shared between the Centre and States in the ratio of 75:25. In the case of UTs, entire funds of IAY are provided by the Centre.



The help provided under IAY spurs construction of homes in rural areas



Bharat Nirman

A Business Plan for Rural Infrastructure

Implementation 2005



- **Irrigation**
- **Rural Roads**
- **Rural Electrification**
- **Rural Water Supply**
- **Rural Housing**

Swabhiman Scheme to Open Bank Accounts in Villages

UPA government has launched a programme named 'Swabhiman' which aims at opening 5 crores no frills accounts by March 2012 in over 73000 villages. 'Swabhiman' is one of the two ambitious programmes of the UPA regime to spread financial inclusion.

The other programme-'Swabhiman'-has already been launched in September last year. The centre provides Rs.1000 as pension for the poor in a year, if they come forward for 'Swabhiman'.

The newly introduced Swabhiman scheme will help a large number of people come under the banking system and thus into the saving mode in the economy. The government in the Budget for 2010-11 announced to provide appropriate banking facilities to 60,000 habitations having population in excess of 2000 by March 2012 and extending insurance and other services to targeted beneficiaries using the business correspondent and other models with appropriate and other models with appropriate technology backup.

Grameen Upjivika Yojana

June2011

Lanunched by department of Rural development (Govt.of India)

To increase domestic income of the rural households

To provide economic services to the rural households

6 lack villages 600 districts will be covered under this scheme

Through self help Groups (SHGS) nearly 7 cr.BPL families will be benefited.

Within a period of 8 to 10 years to cooperate rural households for their subsistance.



Presented By

DR. R. S. SOLUNKE
PROFESSOR
DEPT.OF ECONOMICS,
DR.BABASAHEB AMBEDKAR
MARATHWADA UNIVERSITY,
AURANGABAD
Mo.9049622998

THANK YOU.....

श्रीमती मीनलबेन महेता कॉलेज, पाचगणी

समाजशास्त्र विभाग

बी.ए. भाग— .३ पेपर ०७

पेपरचे नाव :— पाश्चात्य समाजशास्त्रीय विचारवंत

घटक:— कार्ल मार्क्स यांचा द्विद्वैतक भौतिकवाद

प्रा. रद संघवी

प्रस्तावना

मजूर वर्गाचा कैवारी आणि साम्यवादाचा जनक म्हणून ओळखल्या जाणारा एक प्रसिध्द समाजशास्त्रीय विचारवंत म्हणून कार्ल मार्क्सकडे पाहिले जाते.त्याचा द्वद्वात्मक भौतिकवाद हा सिध्दात आपण अभ्यासणार अहोत.

उदिद टये:

- १- कार्ल मार्क्सचा जीवन परिचय समजून घेणे
२. कार्ल मार्क्सचा द्वद्वात्मक भौतिकवाद समजून घेणे

गृहितके : कार्ल मार्क्सचे विचार आजहि मार्गदर्शक ठरत असून त्याच्या विचारांना मान्यता दिली जाते.

माक्सचा द्वात्मक भैतिकवादाचे नियम

१. गतिशिलता

२. घटना अंतसंबंधित आणि आत्मनिर्भर असतात.

३. परिवर्तनशिलता

४. आंतरिक विरोधभास

नि क ि:

समाजाची गति अथवा परिवर्तन हे मार्क्सच्या तत्वानुसारच होताना दिसून येते.

सारांश :

मार्क्स यांचे विचार जाणून घेतल्यानंतर समाजामध्ये होणारे परिवर्तन मार्क्सच्या तत्वानुसार होताना दिसते.

श्रीमती मीनलबेन महेता कॉलेज, पाचगणी
समाजशास्त्र विभाग

बी.ए. भाग .३ पेपर —१०

पेपरचे नाव :— औद्योगिक समाजशास्त्र

घटक :—हेन्री फेयॉल यांचा सिध्दांत आणि तत्वे

प्रा.संतोभा निलाखे

प्रस्तावना

औद्योगिक समाजशास्त्र ही समाजशास्त्राची नवीन शाखा आहे.

औद्योगिक क्षेत्रात व्यवस्थापन काळाची गरज ठरलेली आहे.

व्यवस्थापनाची तत्वे सविस्तरपणे मांडण्याचे श्रेय हेन्री फेयॉल यांना दिले जाते.

उद्दिष्टे

१. हेन्री फेयॉल यांचा सिद्धांत अभ्यासणे.

गृहितके.

हेन्री फेयॉल यांची सैद्धांतिक तत्वे आजही विचारात घेतली जातात.

प्रस्तावना

हेन्री फेयॉल यांचा सिध्दांत

फेयॉल यांनी कामाची विभागणी सर्वसामान्यपणे तांत्रिक आणि अतांत्रिक स्वरूपाची कामे अशा दोन्ही प्रकारच्या कामाची विभागणी क्षमविभागणीच्या तत्वाचा वापर करून केली.

१९०८ मध्ये प्रथम असोसिएशन ऑफ मायनिंग इंडस्ट्री ऑफ एरीन्नो या संस्थेच्या पन्नासाव्या वर्धापन दिनानिमित्त केलेल्या भाषणात व्यवस्थपनाची चौदो तत्वे मांडली.

हेन्री फेयॉल यांची व्यवस्थापनाविषयीची चौदा तत्वे

१. कामाची विभागणी
२. अधिकार आणि जबाबदारी
३. शिस्तपालन
४. हुकूमातील एकता
५. वैयक्तिक हितापेक्षा सामुहिक हितास प्राधान्य
६. मार्गदर्शनातील एकता
७. कर्मचारी वेतन
८. केंद्रिकरण
९. अधिकार साखळी
१०. न्याय वागणुक
११. सुव्यवस्था
१२. सेवेची शाश्वती
१३. स्वयंप्रेरणा
१५. एकता

नि क र्

औद्योगिक क्षेत्रात व्यवस्थापनासाठी चौदा तत्वे ही काळाची गरज असून उद्योगधंद्याची प्रगती कशा प्रकारे आवश्यक आहे. हे या तत्वाद्वारे सांगितले जाते.

सरांश

आधुनिक उद्योगधंद्याचा मुख्य उद्देश सफल होण्यासाठी व्यवस्थापन आणि औपचारीक संघटन जाणिवपूर्वक हेतुपूर्वक निर्माण केले जातात. नियमांची ताठरता आणि निश्चितता यात असते.

संदर्भ सूची

औद्योगिक समाजशास्त्र प्रा. डॉ. संजय हिंदूराव संदे

क्षयवाद



|

French Revolution 1789

WELL-COME

ALL

Mr. Satish Khutale

फ्रांस राज्यक्रांची कारणे

- ०१. राजनैतिक कारणे
- ०२. सामाजिक कारणे
- ०३. आर्थिक कारणे
- ०४. बौधीक जागरण
- ०५. सैनिकांमधील असंतोष



फ्रान्स राज्यक्रांतिचे परिणाम

०१. निरूकुंश सत्तेचा अंत.
०२. सामंती प्रथेचा अंत.
०३. राज्यसत्तेच्या दैवी अधिकाराला आव्हान.
०४. कर प्रणालिमध्ये सुधारणा.
०५. न्यायालयाचे पुनर्गठन केले.
०६. लोकांना धार्मीक स्वातंत्र्य मिळाले.

१.१ राजकिय कारणे –

अ. फ्रांस मध्ये असणारि निरंकुश राजसत्ता.

ब. राजकिय शक्तिचे केंद्रीय करन.

क. फ्रांसचे केलेले सैनिकीकरण

ड. आस्ट्रिया च्या उत्तरअधिकारी प्रश्नामध्ये
केलेला हस्तक्षेप.

इ. मेरि एन्टोनिएट चा असणारा १६ व्या लुई
वरिल प्रभाव.

१.२ सामाजिक कारणे —

अ. फ्रांसमधील समाज विघटित आणि विषम होता.

ब. फ्रांसमधील समाज तिन वर्गांमध्ये विभागला गेला होता.

१. प्रथम स्टेट

२. द्वितीय स्टेट

मीनल मेहता कॉलेज पाचगणी
इतिहास विभाग

शिवाजी महाराजांचे किल्ला
प्रशासन

शिवकालीन किल्ल्यांची प्रकार

गिरिदुर्ग
जलदुर्ग
भुईकोट किल्ला

किल्ल्यावरील सैन्य रचना

9 सैनिकांवर एक नाईक

3 नाईकांवर एक जमादार

सर्व जमादारांवर एक हवालदार

किल्ल्यावरील प्रशासकीय अधिकारी

हवालदार/ किल्लेदार /गडकरी किल्ल्याच्या संरक्षणाची संपूर्ण जबाबदारी त्याची असे. किल्ल्याच्या दरवाज्याच्या किल्ल्या त्याच्याजवळ असत.

सबनीस किल्ल्याचा जमाखर्च पाहणे, किल्ल्यावरील लोकांची हजेरी घेणे.

कारखानीस किल्ल्या वरील दारूगोळा, शस्त्रास्त्रे, अन्नधान्य कोठारे त्याच्या ताब्यात असत.

तटसरनौबत हवालदाराच्या अंगी जे गुण असणे आवश्यक केले आहे ते सर्व गुण तटसरनौबत याच्या अंगी असले पाहिजेत त्याची निवड स्वतः छत्रपती करत असत .

Department of Geography

1

बी. ए. भाग दोन
पेपर २

मानवी भूगोल

प्रा. यु. बी. जाधव

प्रकरण २ लोकसंख्या

■ लोकसंख्या वितरणावर
परिणाम करणारे घटक

१. प्राकृतिक घटक

२. आर्थिक घटक

३. ऐतिहासिक घटक

४. सामाजिक घटक

५. सांस्कृतिक घटक

माल्थसचा लोकसंख्या सिद्धांतः—

१. वैशिष्ट्ये
२. प्रथम आवस्था
३. द्वितीय आवस्था
४. तृतीय आवस्था

धन्यवाद

THANK YOU!

DEPARTMENT OF POLITICAL SCIENCE

1

बी. ए. भाग दोन

पेपर २

भारतीय राज्यघटना

डॉ. अरूण गाडे

भारतीय राज्यघटनेची वैशिष्ट्ये

- लिखित व विस्तृत राज्यघटना
- अंशतः परिदृढ व अंशतः परिवर्तनिय राज्यघटना
- जनतेचे सार्वभौमत्व
- सार्वभौम, समाजवादी, धर्मनिरपेक्ष, लोकशाही, गणराज्य
- संसदीय शासनपद्धती
- संघराज्य व्यवस्था
- मूलभूत अधिकार
- मार्गदर्शक तत्वे
- स्वतंत्र न्यायदान पद्धत

- पौढ मताधिकार
- अल्पसंख्यांक व मागासवर्गीय लोकांना सवलत
- एकेरी नागरिकत्व व एकच राज्यघटना
- व्दिगृहात्मक कायदेमंडळ

धन्यवाद

THANK YOU!

**Shri Swami Vivekanand
Shikshan Sanstha
Kolhapur's
Smt. Meenalben Mehta
College, Panchgani**

Department of Physics

B.Sc. Part II


Topic : Nuclear Fission Reaction

Prepared By Mr S. N. Nawghare



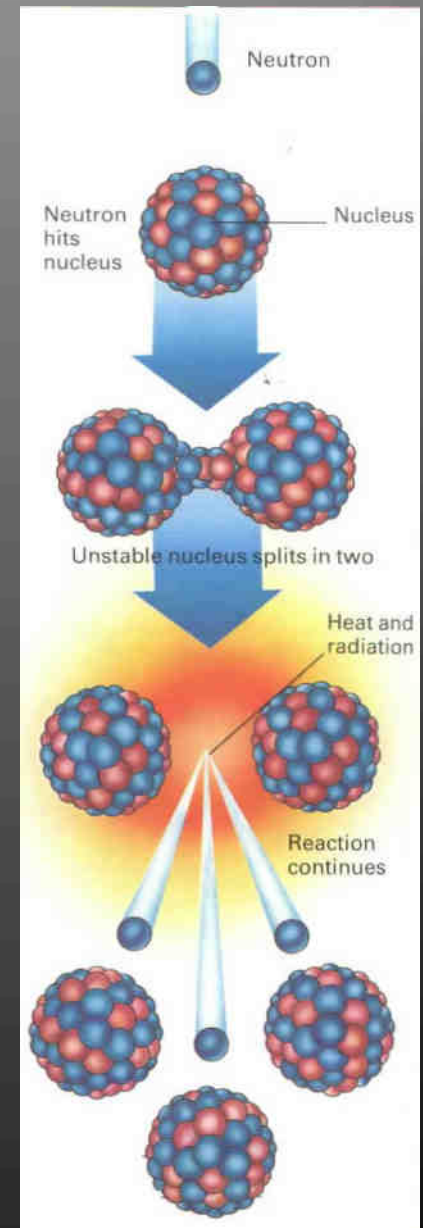
Nuclear Fission

Benefits of Nuclear Energy

- ▶ Continuous, reliable supply of energy
 - ▶ Well-developed technology
 - 12,700 reactor-years of commercial experience
 - Accounts for ~16% of world electricity generation
 - ▶ Extensive fuel supply
 - Breeder reactors
 - Fissile materials other than Uranium
- 

How Fission Works

- ▶ Water or other moderator slows neutrons, thermalizing them
- ▶ Thermal neutron collides with U-235
- ▶ Unstable nucleus splits in two
- ▶ Energy and neutrons are released
- ▶ Reaction repeats



**SHRI SWAMI VIVEKANAND
SHIKSHAN SANSTHA
KOLHAPUR'S
SMT. MEENALBEN MEHTA
COLLEGE, PANCHGANI**

Department of Chemistry

B.Sc. Part III

Topic : Nuclear Fusion Reaction

Prepared By Dr B. N. Kokare



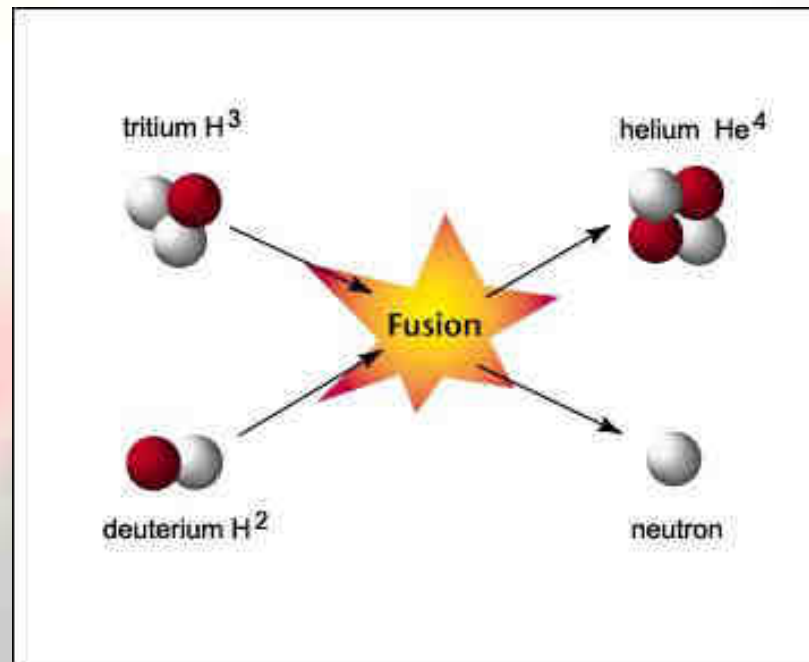
NUCLEAR FUSION ENERGY

NUCLEAR FUSION PRINCIPLE

- ◉ Energy generated by joining two elements with low atomic numbers.
- ◉ Most efficient reaction known is fusion of Hydrogen isotopes, Deuterium and Tritium, to form Helium.
- ◉ Fusion is source of energy for stars and the Sun.
- ◉ High temperatures > 100 million degrees Kelvin needed for fusion on earth
- ◉ At high temperature, the gas mixture forms a plasma (hot, electrically charged gas)

NUCLEAR FUSION

- ⦿ This reaction releases 17.6 MeV of energy. No limit on amount of fusion that can occur (unlike fission).



WELCOME

WESTERN BLOTTING TECHNIQUES

Presented by:

Dr. Dr. S K Khade

Western Blotting Techniques (Protein Blotting)

In 1979, H.Towbin and coworkers developed the western blotting technique to find out the newly enclosed protein by a transformed cell.

Its working principle lies on antigen – antibody reaction; hence it is on immuno detection technique.

In this method radiolabelled nucleic acid probes are not used.

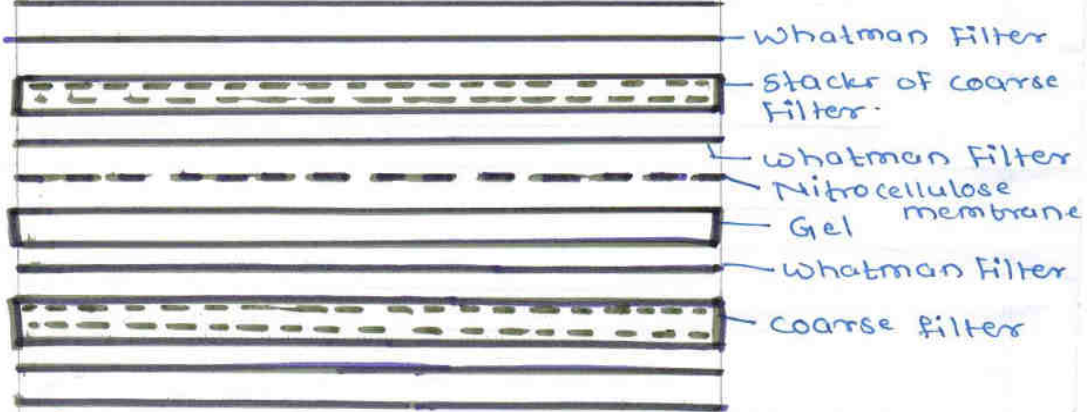
This technique follows the following steps:

1. Extraction of protein from transformed cells
2. Separation of protein by using SDS- PAGE (Sodium Dodecyl Sulphate Polyacrylamide Gel Electrophoresis) where SDS acts as solvent for electrophoresis
3. Transfer of electrophoresed gel in a buffer of low temp.(40⁰C) for half an hour.
4. Blotting of protein on to nitrocellulose filter paper.

6. Soaking of nitrocellulose filter, whatman filter and coarse filter in transfer buffer.
7. Placing of whatman filter paper on a cathode plate followed by stack of coarse filter, whatman filter, electrophoresed gel, nitrocellulose filter, whatman filter paper, coarse filter stack, whatman filter and anode plate.
8. Putting the complete setup in transfer tank containing sufficient transfer buffer.

(A)

(+) Anode

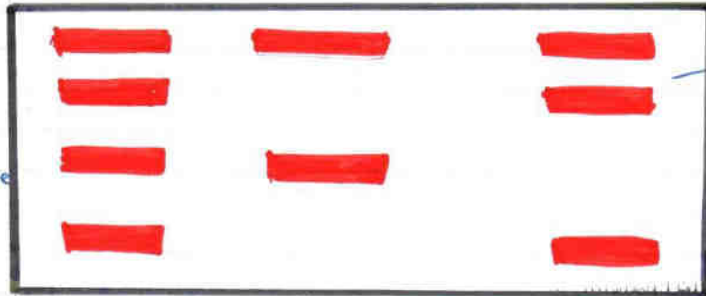


- Whatman Filter
- Stacker of coarse Filter
- Whatman Filter
- Nitrocellulose membrane
- Gel membrane
- Whatman Filter
- coarse filter

(-) cathode

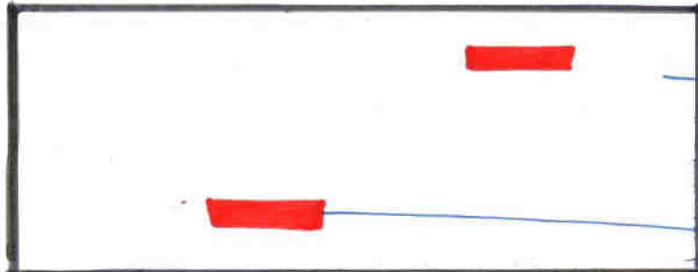
Blotting (transfer) of protein on membrane

(B)



Nitrocellulose filter paper

- incubate with radiolabelled antibody
- wash to remove unbound antibody
- pass through x-ray for 4 hours



Autoradiogram

Hybridised protein

9. Application of an electric field (30 V overnight for 5 hours to cause the migration of protein from) the gel to nitrocellulose filter has exact image of pattern of protein are present in the gel.
This type of blotting is called western blotting.

10. Hybridization of protein by using radiolabelled antibodies (I^{123} -antibodies) of known structure, isolated from the rabbit

THANK YOU

**Smt. Meenalben Mehta college,
Panchgani.**

Department Of Chemistry

MR. M. K. SAKATE

NMR Spectroscopy

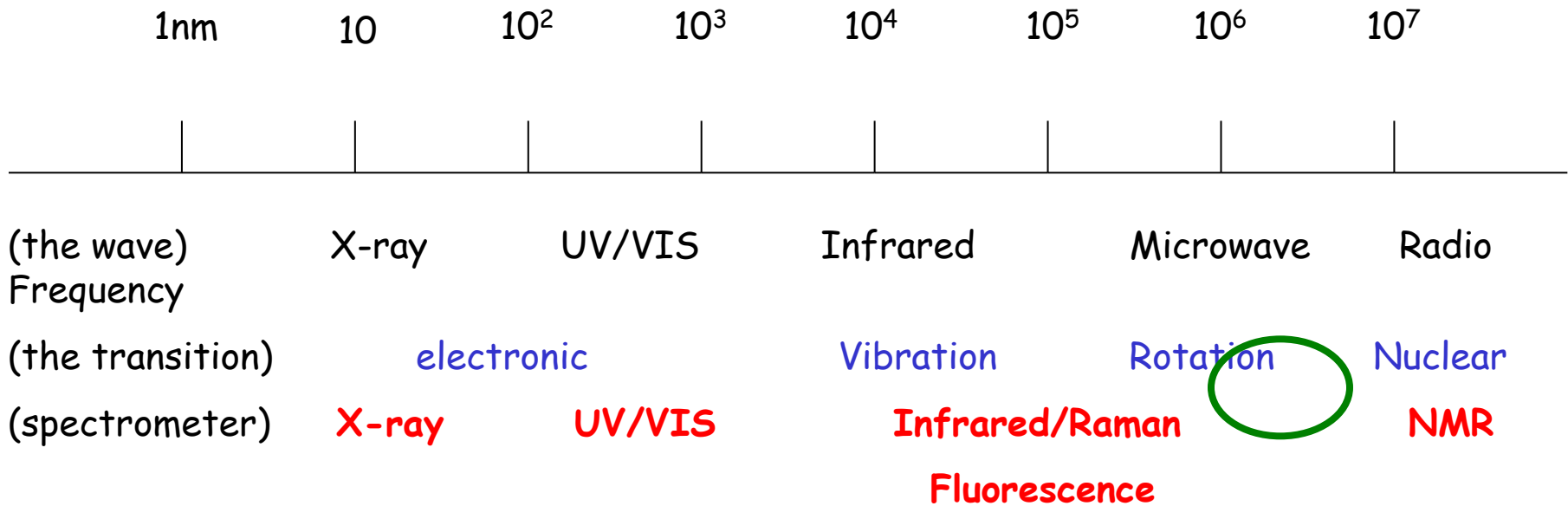
Introductory to NMR Spectroscopy

Ref:

1. NMR Spectroscopy, Basic Principles and Applications, by **Roger S. Macomber**
2. <http://www.cis.rit.edu/htbooks/nmr/> by **Joseph P. Hornak**
3. Some figures copy from the web page by **Guillermo Moyna**, University of the Sciences in Philadelphia
4. Wüthrich, K. "NMR of Proteins and Nucleic Acids", Wiley, 1986. 科儀新知1994年六月份
5. Cavanagh, J. et al., "Protein NMR Spectroscopy-Principles and Practice", Academic Press, 1996.
6. Van de Ven, F.J. (1995), "Multi-dimensional NMR in Liquid-Basic Principles & Experimental Methods". VCH Publishing

NMR Spectroscopy

Where is it?



NMR Historic Review

- 1924 Pauli proposed the presence of nuclear magnetic moment to explain the hyperfine structure in atomic spectral lines.
- 1930 Nuclear magnetic moment was detected using refined Stern-Gerlach experiment by Estermann.
- 1939 Rabi et al. First detected nuclear magnetic resonance phenomenon by applying r.f. energy to a beam of hydrogen molecules in the Stern-Gerlach set up and observed measurable deflection of the beam.
- 1946 Purcell et al. at Harvard reported nuclear resonance absorption in paraffin wax.
Bloch et al. at Stanford found nuclear resonance in liquid water.
- 1949 Chemical shift phenomenon was observed.
- 1952 Nobel prize in Physics was awarded to Purcell and Bloch.
- 1966 Ernst and Anderson first introduce the Fourier Transform technique into NMR.

Late in the 1960s:

- Solid State NMR was revived due to the effort of Waugh.
- and associates at MIT.
- Biological application become possible due to the introduction superconducting magnets.
- NMR imaging was demonstrated.

1970 2D NMR was introduced.

1980s Macromolecular structure determination in solution by NMR was achieved.

1991 Nobel prize in Chemistry was awarded to Richard Ernst.

1990s Continuing development of heteronuclear multi-dimensional NMR permit the determination of protein structure up to 50 KDa.
MRI become a major radiological tool in medical diagnostic.

2002 Nobel prize in Chemistry was awarded to Kurt Wuthrich

NMR is a versatile tool and it has applications in wide varieties of subjects in addition to its chemical and biomedical applications, including material and quantum computing.



Edward M. Purcell
1912-1997



Felix Bloch
1905-1983



Richard R. Ernst
1933-



Kurt Wuthrich
1938-



CW NMR 40MHz

1960



800 MHz

6 12 2001

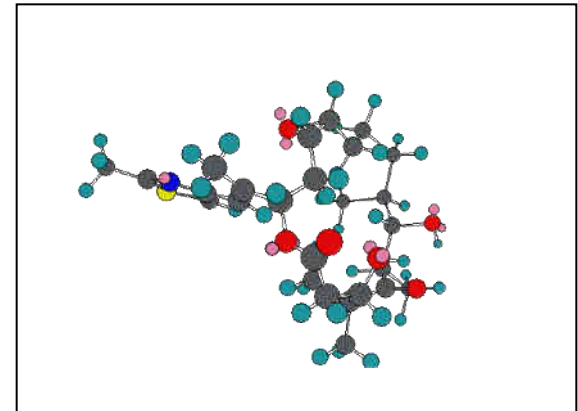
The problem the we want to solve by NMR

What we "really"
see

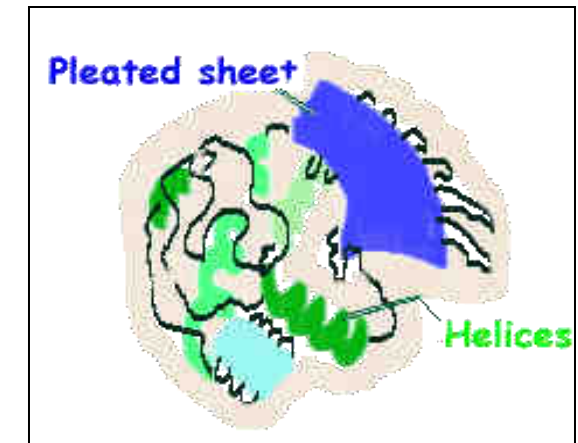


NMR

What we want to "see"



Pleated sheet



Before using NMR
What are **N**, **M**, and **R** ?

Properties of the **Nucleus**

Nuclear spin

Nuclear magnetic moments

The Nucleus in a **Magnetic** Field

Precession and the Larmor frequency

Nuclear Zeeman effect & Boltzmann distribution

When the Nucleus Meet the right Magnet and radio wave

*Nuclear Magnetic **Resonance***

◆ Properties of the Nucleus

Nuclear spin

- **Nuclear spin** is the total nuclear angular momentum quantum number. This is characterized by a quantum number **I**, which may be integral, half-integral or 0.
- Only nuclei with spin number $I \neq 0$ can absorb/emit electromagnetic radiation. The **magnetic quantum number** m_I has values of $-I, -I+1, \dots, +I$. (e.g. for $I=3/2$, $m_I=-3/2, -1/2, 1/2, 3/2$)

1. A nucleus with an even mass A and even charge $Z \rightarrow$ nuclear spin I is zero

Example: $^{12}\text{C}, ^{16}\text{O}, ^{32}\text{S} \rightarrow$ No NMR signal

2. A nucleus with an even mass A and odd charge $Z \rightarrow$ integer value I

Example: $^2\text{H}, ^{10}\text{B}, ^{14}\text{N} \rightarrow$ NMR detectable

3. A nucleus with odd mass $A \rightarrow I=n/2$, where n is an odd integer

Example: $^1\text{H}, ^{13}\text{C}, ^{15}\text{N}, ^{31}\text{P} \rightarrow$ NMR detectable

Nuclear magnetic moments

Magnetic moment μ is another important parameter for a nuclei

$$\mu = \gamma \mathbf{I} (h/2\pi)$$

\mathbf{I} : spin number; h : Plank constant;

γ : gyromagnetic ratio (property of a nuclei)

$${}^1\mathbf{H}: \quad \mathbf{I}=1/2, \gamma = 267.512 * 10^6 \text{ rad T}^{-1}\text{S}^{-1}$$

$${}^{13}\mathbf{C}: \quad \mathbf{I}=1/2, \gamma = 67.264 * 10^6$$

$${}^{15}\mathbf{N}: \quad \mathbf{I}=1/2, \gamma = 27.107 * 10^6$$

Table 1.1 Nuclei of Major Interest to NMR Spectroscopists

Iostope	Abundance (%)	Z	Spin	μ^2	$\gamma \times 10^{-8b}$	Relative ^c sensitivity	ν_0 at 1T(MHz)	At 7.04T
¹ H	99.9844	1	1/2	2.7927	2.6752	1.000	42.577	300
² H	0.0156	1	1	0.8574	0.4107	0.00964	6.536	46
¹⁰ B	18.83	5	3	1.8006	0.2875	0.0199	4.575	
¹¹ B	81.17	5	3/2	2.6880	0.8583	0.165	13.660	
¹³ C	1.108	6	1/2	0.7022	0.6726	0.0159	10.705	75.4
¹⁴ N	99.635	7	1	0.4036	0.1933	0.00101	3.076	
¹⁵ N	0.365	7	1/2	-0.2830	-0.2711	0.00104	4.315	30.4
¹⁹ F	100	9	1/2	2.6273	2.5167	0.834	40.055	282.3
²⁹ Si	4.70	14	1/2	-0.5548	-0.5316	0.0785	8.460	
³¹ P	100	15	1/2	1.1305	1.0829	0.0664	17.235	121.4

a Magnetic moment in units of the nuclear magneton, $eh/(\Delta\mu M_p c)$

b Magnetogyric ratio in SI units

c For equal numbers of nuclei at constant field

◆ The Nucleus in a Magnetic Field

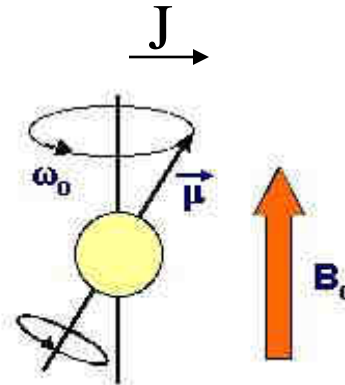
Precession and the Larmor frequency

- The magnetic moment of a spinning nucleus precesses with a characteristic angular frequency called the **Larmor frequency** ω , which is a function of r and B_0

Remember $\mu = \gamma I (h/2\pi)$?

Angular momentum $dJ/dt = \mu \times B_0$

Larmor frequency $\omega = rB_0$



Linear precession frequency $\nu = \omega/2\pi = rB_0/2\pi$

Example: At what field strength do ^1H precess at a frequency of 600.13MHz? What would be the precession frequency for ^{13}C at the same field?

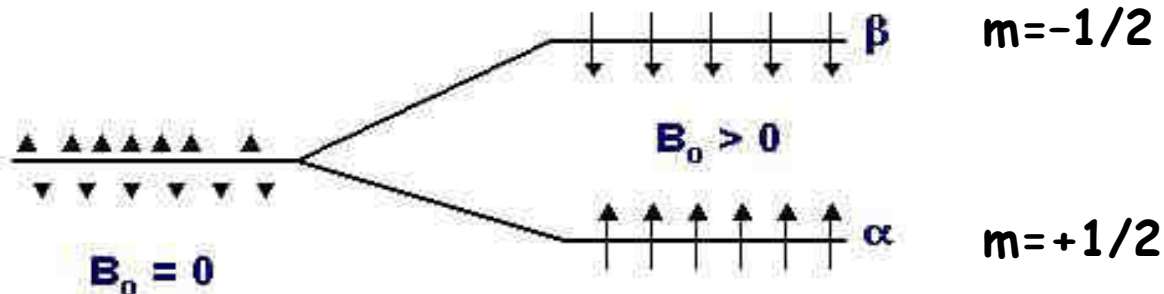
Nuclear Zeeman effect

- **Zeeman effect:** when an atom is placed in an external magnetic field, the energy levels of the atom are split into several states.
- The energy of a give spin sate (E_i) is directly proportional to the value of m_I and the magnetic field strength B_0

$$\text{Spin State Energy } E_I = -\mu \cdot B_0 = -m_I B_0 r(h/2p)$$

- Notice that, the difference in energy will always be an integer multiple of $B_0 r(h/2p)$. For a nucleus with $I=1/2$, the energy difference between two states is

$$\Delta E = E_{-1/2} - E_{+1/2} = B_0 r(h/2p)$$



The Zeeman splitting is proportional to the strength of the magnetic field

Boltzmann distribution

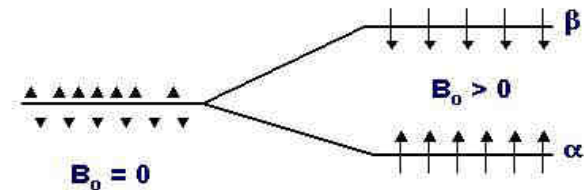
- Quantum mechanics tells us that, for **net absorption** of radiation to occur, there must be **more particles in the lower-energy state than in the higher one**. If **no net absorption** is possible, a condition called **saturation**.
- When it's saturated, Boltzmann distribution comes to rescue:

$$\text{➤ } P_{m=-1/2} / P_{m=+1/2} = e^{-DE/KT}$$

where P is the fraction of the particle population in each state,

T is the absolute temperature,

k is Boltzmann constant $1.381 \cdot 10^{-28} \text{ JK}^{-1}$

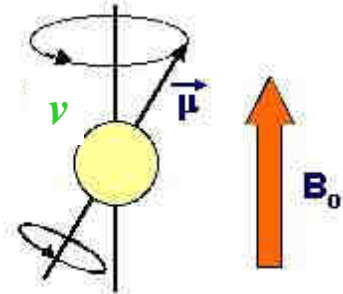


- Example: At 298K, what fraction of ^1H nuclei in 2.35 T field are in the upper and lower states? ($m=-1/2$: 0.4999959 ; $m=1/2$: 0.5000041)
- The difference in populations of the two states is only on the order of few **parts per million**. However, this difference is sufficient to generate NMR signal.
- **Anything that increases the population difference will give rise to a more intense NMR signal.**

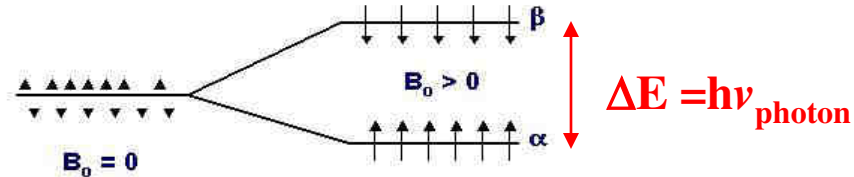
◆ When the Nucleus Meet the Magnet

Nuclear Magnetic Resonance

- For a particle to absorb a photon of electromagnetic radiation, the particle must first be in some sort of uniform periodic motion
- If the particle “uniformly periodic moves” (i.e. precession) at $\nu_{\text{precession}}$, and absorb energy. The energy is $E = h\nu_{\text{precession}}$
- For $I=1/2$ nuclei in B_0 field, the energy gap between two spin states:



$$\Delta E = rhB_0/2\pi$$



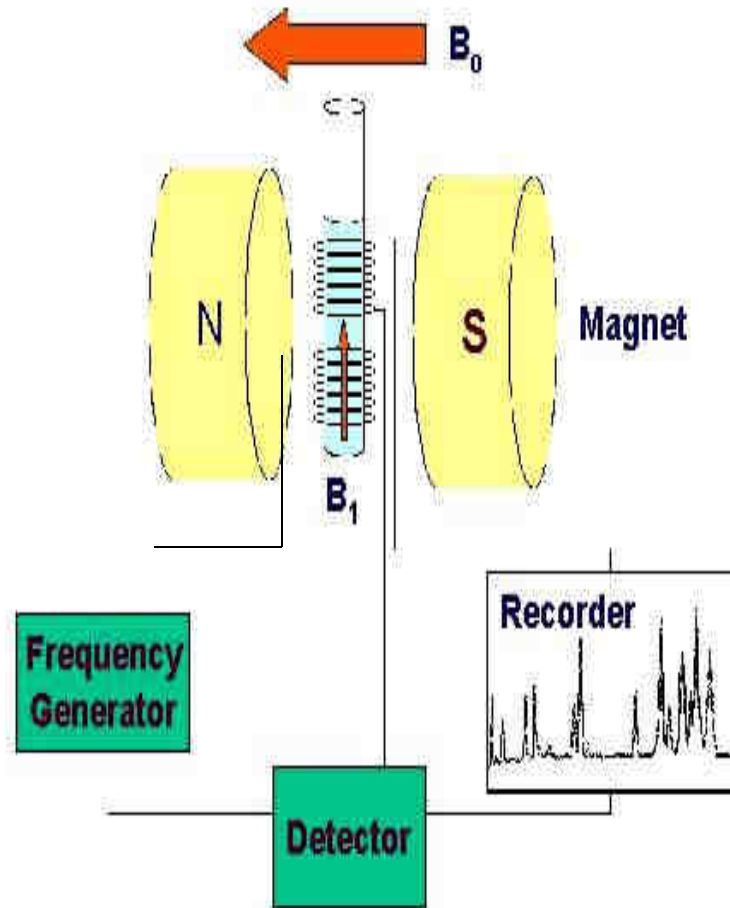
- The radiation frequency must exactly match the precession frequency

$$E_{\text{photon}} = h\nu_{\text{precession}} = h\nu_{\text{photon}} = \Delta E = rhB_0/2\pi$$

→ This is the so called “ Nuclear Magnetic RESONANCE”!!!!!!!!!!!!

Nuclear Magnetic Resonance Spectrometer

How to generate signals?



B_0 : magnet

B_1 : applied small energy

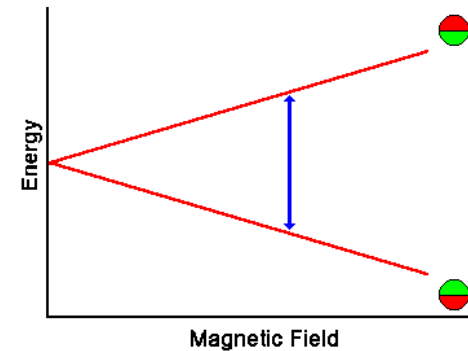
◆ Magnet B_0 and irradiation energy B_1

B_0 (the magnet of machine)

(1) Provide energy for the nuclei to spin

$$E_i = -m_i B_0 \quad (r\hbar/2\pi)$$

$$\text{Larmor frequency } \omega = rB_0$$



(2) Induce energy level separation (Boltzmann distribution)

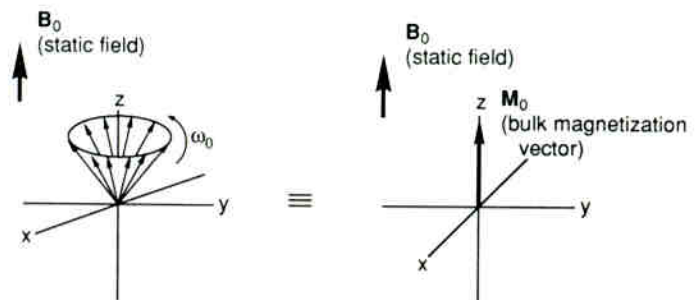
The stronger the magnetic field B_0 , the greater separation between different nuclei in the spectra

$$\Delta\nu = \nu_1 - \nu_2 = (r_1 - r_2)B_0/2\pi$$

(3) The nuclei in both spin states are randomly oriented around the z axis.

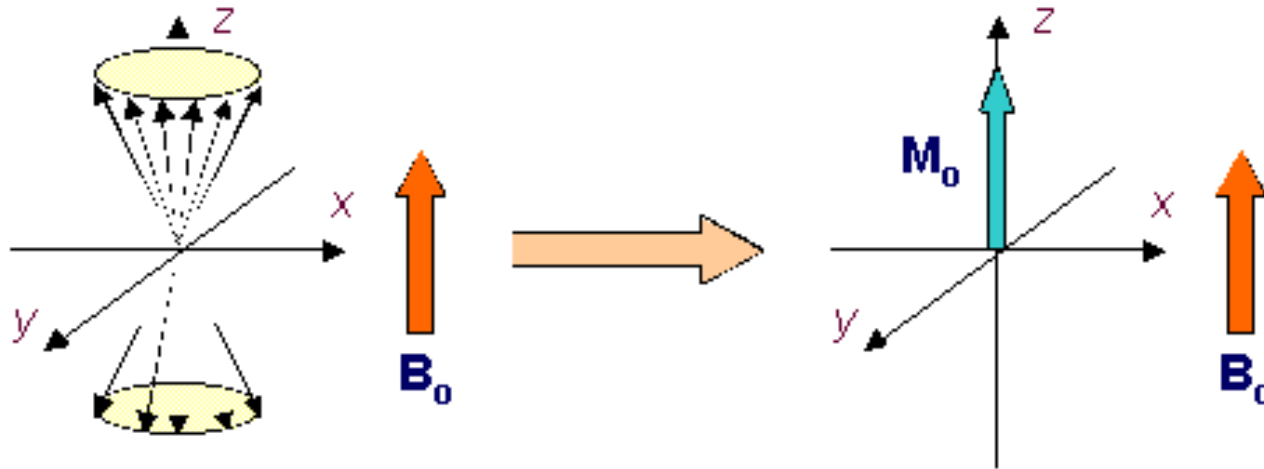
$$M_z = M, M_{xy} = 0$$

(where M is the net nuclear magnetization)



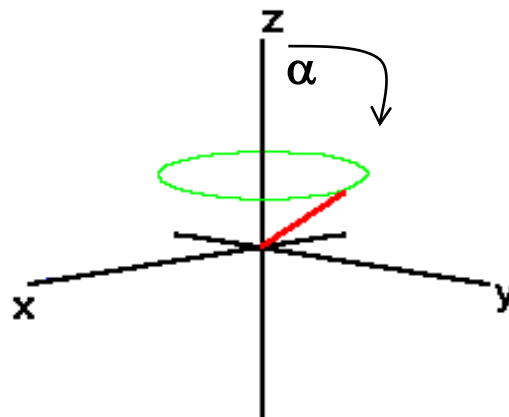
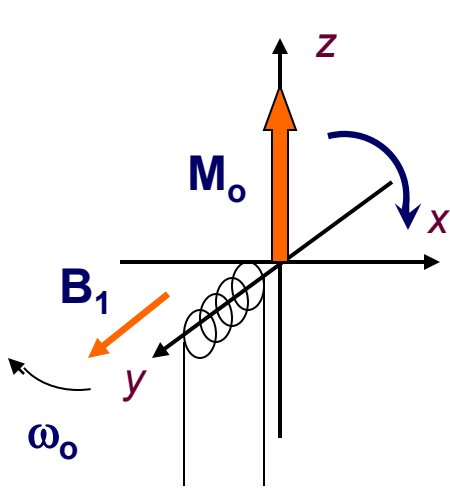
What happen before irradiation

- Before irradiation, the nuclei in both spin states are precessing with characteristic frequency, but they are completely **out of phase**, i.e., randomly oriented around the z axis. The net nuclear magnetization M is aligned statically along the z axis ($M=M_z$, $M_{xy}=0$)

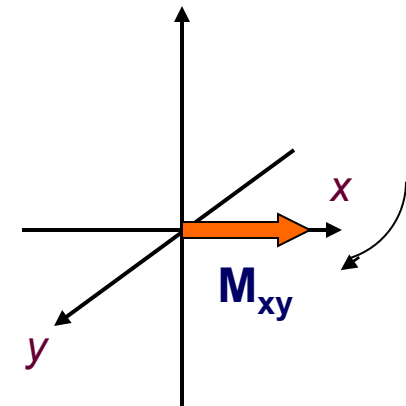


What happen during irradiation

When irradiation begins, all of the individual nuclear magnetic moments become **phase coherent**, and this phase coherence forces the net magnetization vector M to precess around the z axis. As such, M has a component in the x, y plan, $M_{xy} = M \sin \alpha$. α is the **tip angle** which is determined by the **power and duration of the electromagnetic irradiation**.



α deg pulse



90 deg pulse

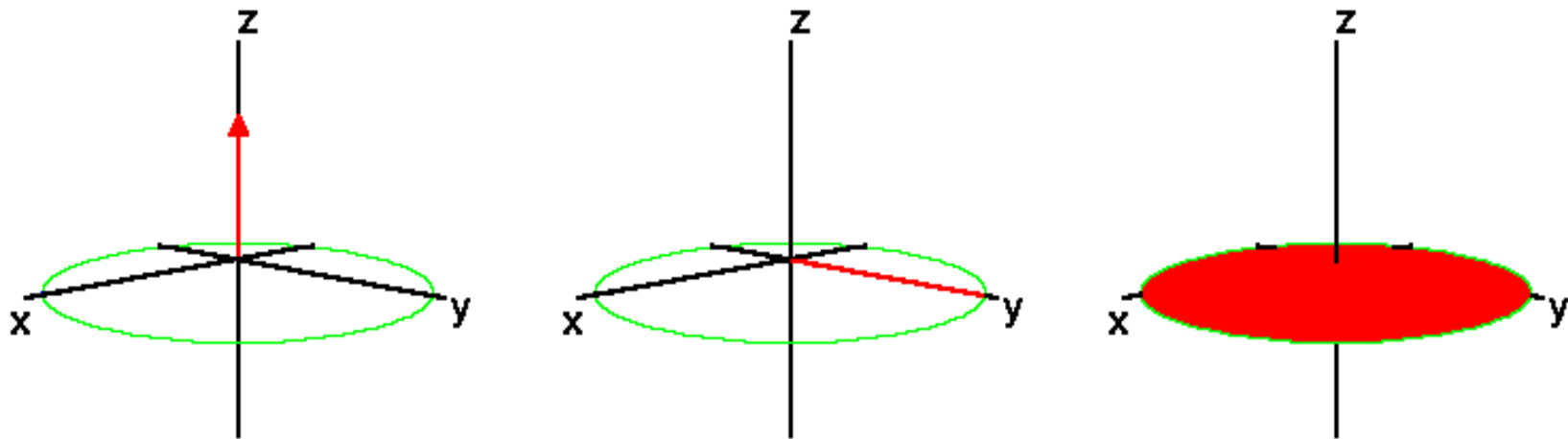
What happen after irradiation ceases

•After irradiation ceases, not only do the population of the states revert to a **Boltzmann distribution**, but also the individual nuclear magnetic moments begin to lose their phase coherence and return to a **random** arrangement around the z axis.

(NMR spectroscopy record this process!!)

•This process is called “relaxation process”

•There are two types of relaxation process : T1 (spin-lattice relaxation) & T2 (spin-spin relaxation)

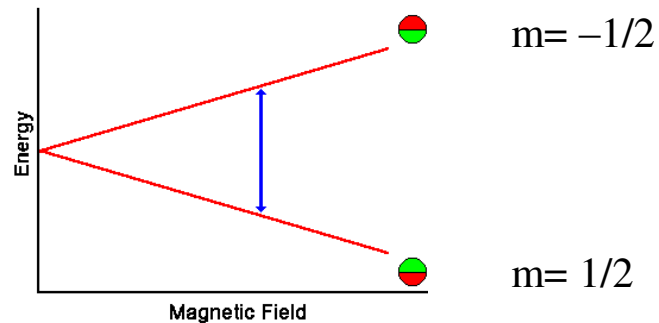


B₁(the irradiation magnet, current induced)

(1) Induce energy for nuclei to absorb, but still spin at ω or $\nu_{\text{precession}}$

$$E_{\text{photon}} = h\nu_{\text{photon}} = \Delta E = \hbar\gamma B_0 / 2\pi = h\nu_{\text{precession}}$$

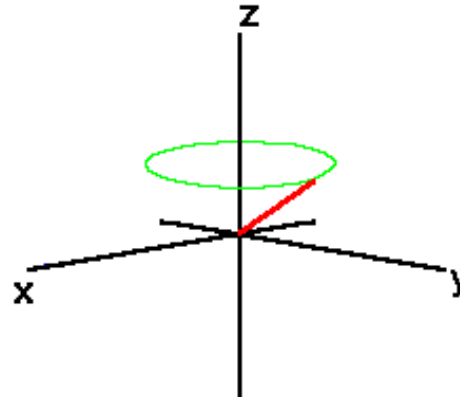
And now, the spin jump to the higher energy (from $m=1/2 \rightarrow m= - 1/2$)



(2) All of the individual nuclear magnetic moments become phase coherent, and the net M process around the z axis at α angle

$$M_z = M \cos\alpha$$

$$M_{xy} = M \sin\alpha.$$



T1 (the spin lattice relaxation)

- How long after immersion in a external field does it take for a collection of nuclei to reach Boltzmann distribution is controlled by T1, the spin lattice relaxation time.

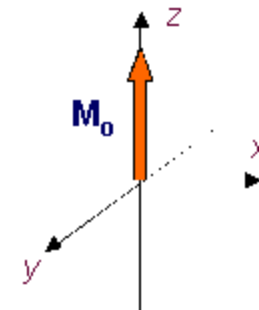
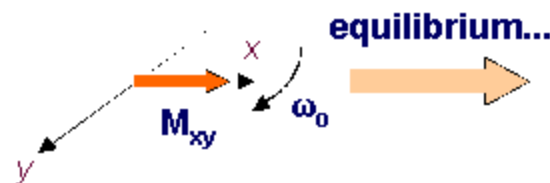
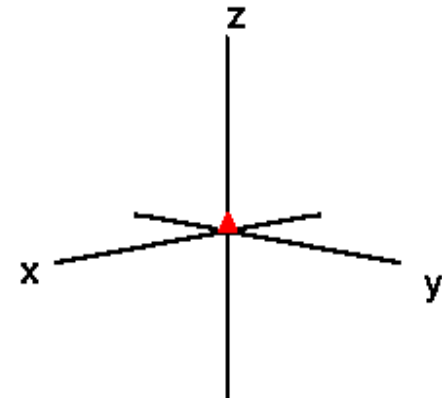
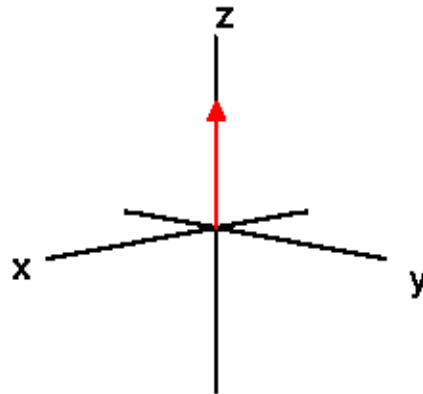
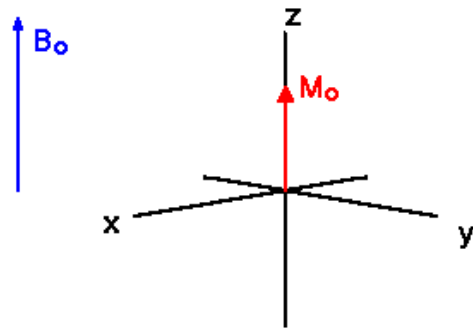
(major **Boltzmann distribution effect**)

- Lost of energy in system to surrounding (lattice) as heat

(release extra energy)

- It's a time dependence exponential decay process of Mz components

$$dM_z/dt = -(M_z - M_{z,eq})/T1$$



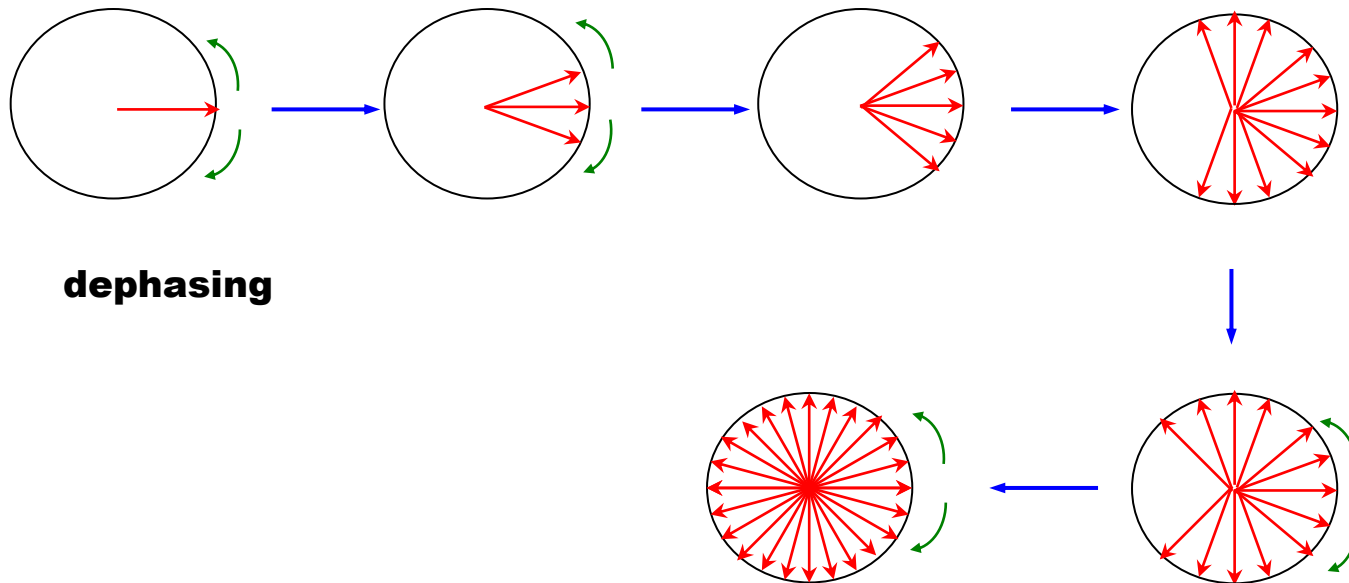
T2 (the spin-spin relaxation)

• This process for nuclei begin to lose their phase coherence and return to a random arrangement around the z axis is called spin-spin relaxation.

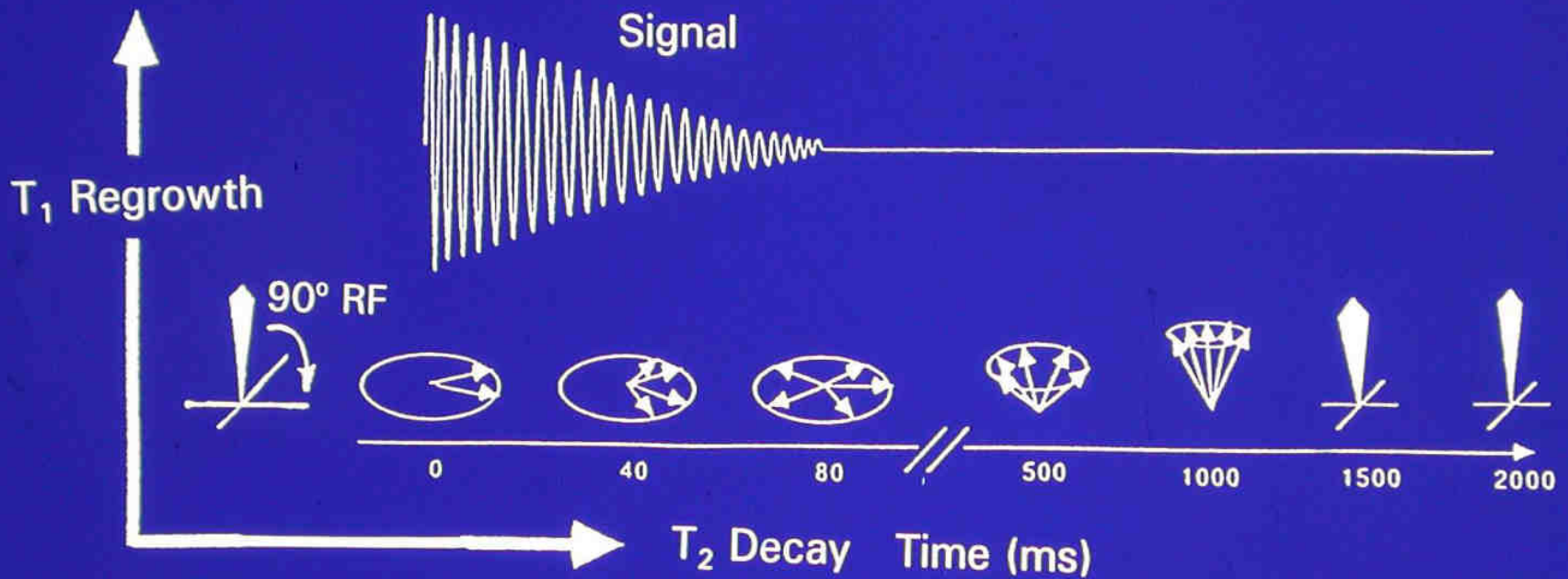
• The decay of M_{xy} is at a rate controlled by the spin-spin relaxation time T2.

$$dM_x/dt = -M_x/T2$$

$$dM_y/dt = -M_y/T2$$



NMR Relaxation

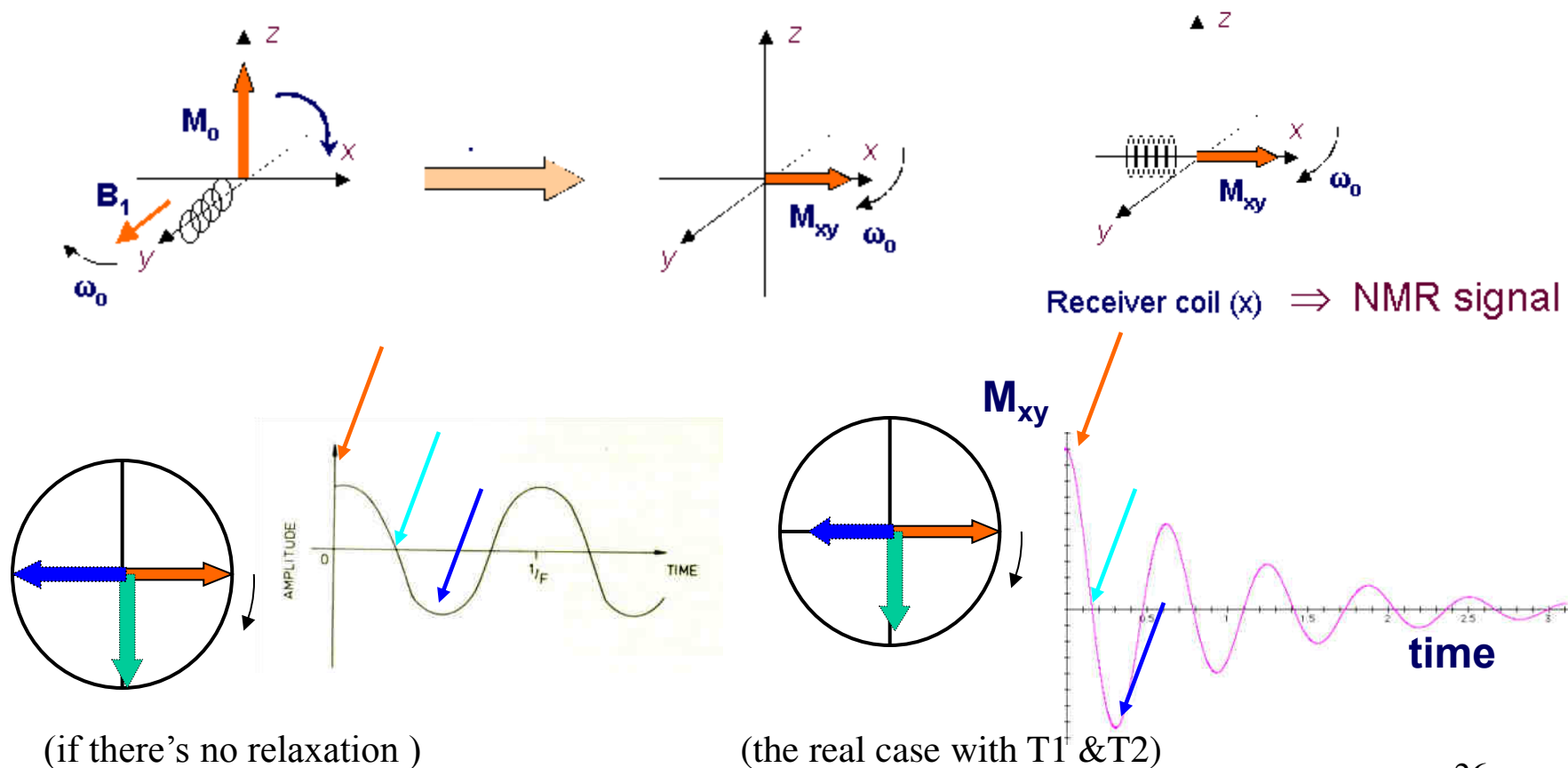


Spin-lattice relaxation (T_1) and spin-spin relaxation (T_2) of nuclear spins. Figure shows the evolution of the magnetization after it has been flipped by 90° pulse.

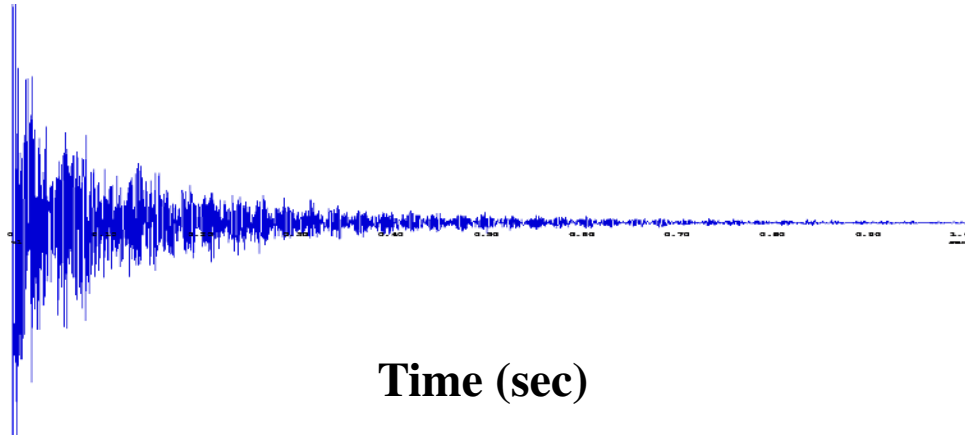
◆ Collecting NMR signals

•The detection of NMR signal is on the xy plane. The oscillation of M_{xy} generate a current in a coil, which is the NMR signal.

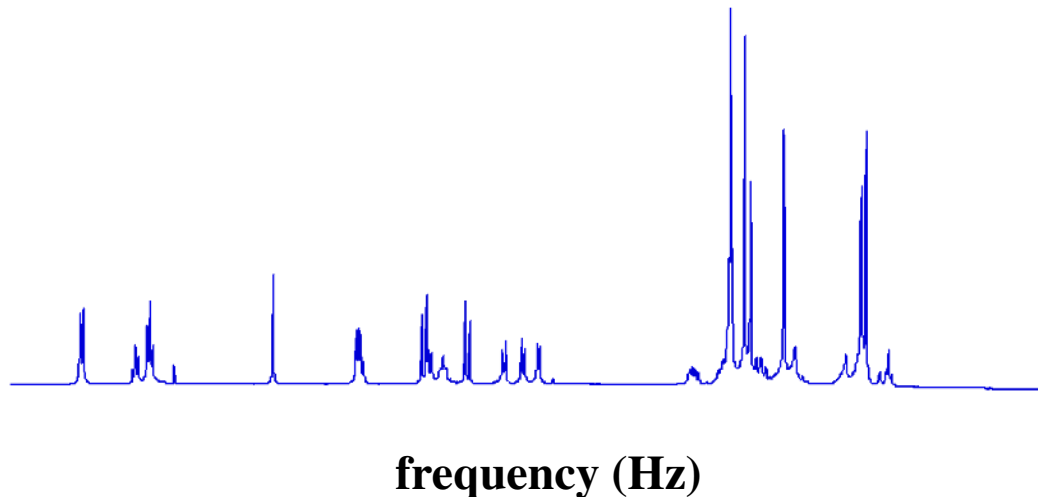
•Due to the “relaxation process”, the time dependent spectrum of nuclei can be obtained. This time dependent spectrum is called “free induction decay” (FID)



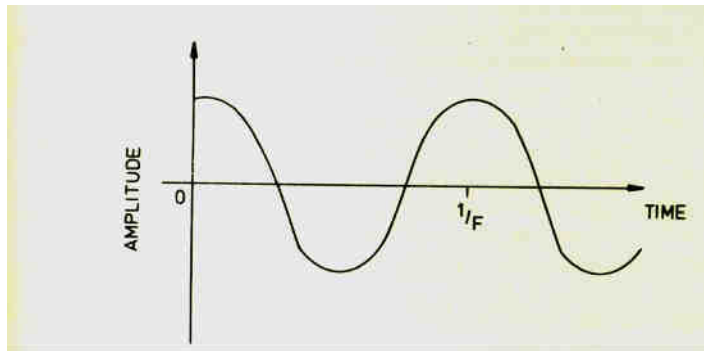
•In addition, most molecules examined by NMR have several sets of nuclei, each with a different precession frequency.



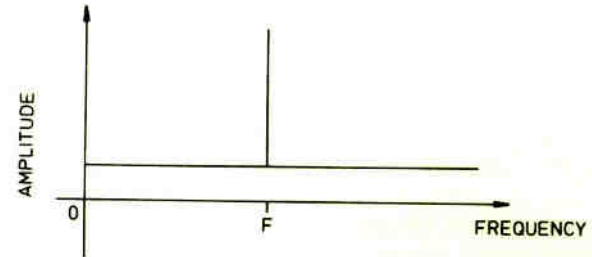
•The FID (free induction decay) is then **Fourier transform** to frequency domain to obtain each $\nu_{\text{precession}}$ (chemical shift) for different nuclei.



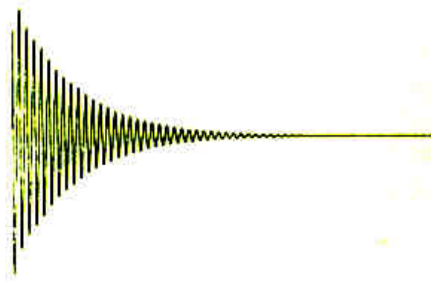
Fourier transformation (FT)



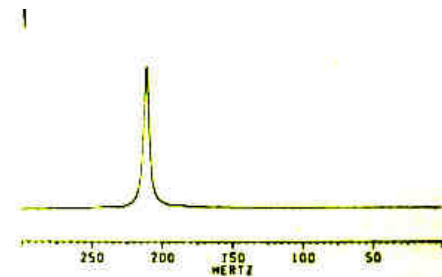
FT
→



$$f(\omega) = \int_{-\infty}^{+\infty} f(t) e^{-i\omega t} dt = \int_{-\infty}^{+\infty} f(t) [\cos(\omega t) - i \sin(\omega t)] dt$$



FT
→



AT 71000 GAUSS (7.1 TELSLSA)

(1T = 10,000G)

0

30

75

121

280

300

320

↑
¹⁵N

↑
¹³C

↑
³¹P

↑
¹⁹F

↑
¹H

↑
³H

NMR signals

- We have immersed our collection of nuclei in a magnetic field, each is precessing with a characteristic frequency, To observe resonance, all we have to do is irradiate them with electromagnetic radiation of the appropriate frequency.

- It's easy to understand that **different nucleus “type” will give different NMR signal.**

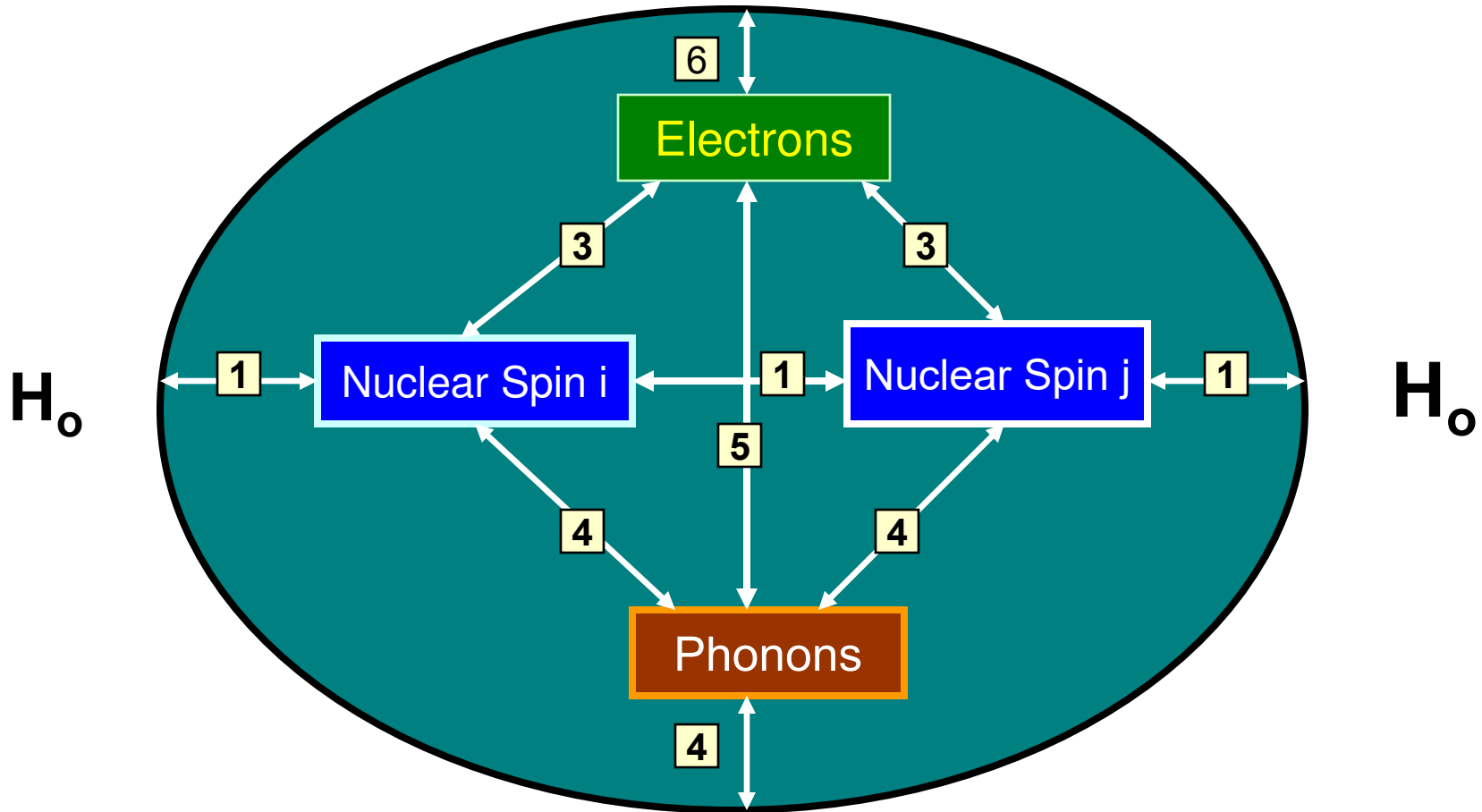
(remember $\nu = \omega/2\pi = \gamma B_0/2\pi$? Thus, different γ cause different ν !!)

- However, it is very important to know that for **same “nucleus type”, but “different nucleus” could generate different signal.** This is also what make NMR useful and interesting.

- Depending on the *chemical environment*, there are **variations** on the magnetic field that the **nuclei feels**, even for the same type of nuclei.

- The main reason for this is, each nuclei could be surrounded by different electron environment, which make the nuclei “feel” different net magnetic field , B_{effect}

Basic Nuclear Spin Interactions



Dominant interactions:

$$H = H_Z + H_D + H_S + H_Q$$

H_Z = Zeeman Interaction

H_D = Dipolar Interactions

H_S = Chemical Shielding Interaction.

H_Q = Quadrupolar Interaction

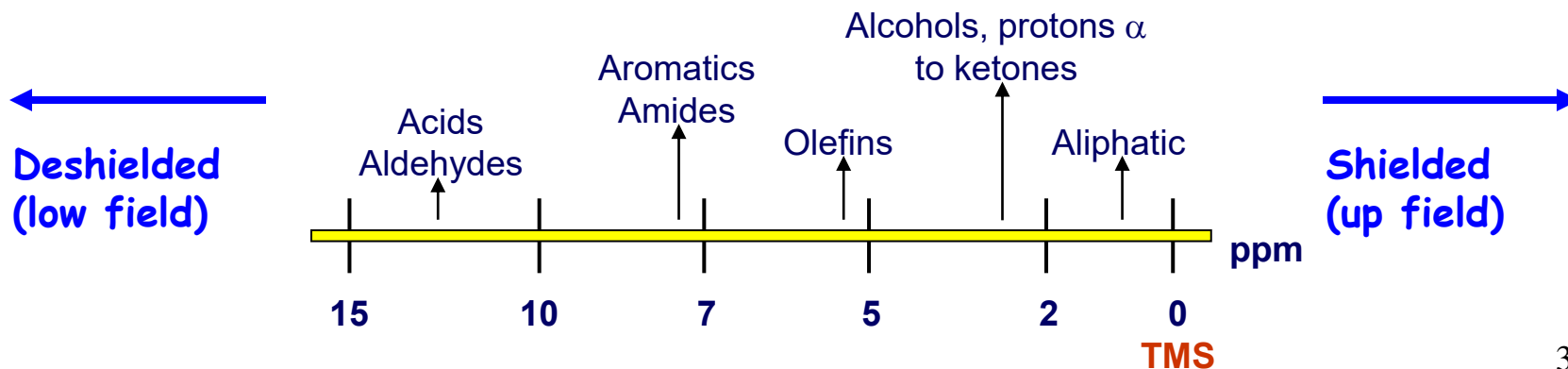
NMR Parameters

◆ Chemical Shift

- The **chemical shift** of a nucleus is the difference between the resonance frequency of the nucleus and a standard, relative to the standard. This quantity is reported in ppm and given the symbol delta,

$$\delta = (\nu - \nu_{\text{REF}}) \times 10^6 / \nu_{\text{REF}}$$

- In NMR spectroscopy, this standard is often tetramethylsilane, $\text{Si}(\text{CH}_3)_4$, abbreviated TMS, or 2,2-dimethyl-2-silapentane-5-sulfonate, DSS, in biomolecular NMR.
- The good thing is that since it is a relative scale, the δ for a sample in a 100 MHz magnet (2.35 T) is the same as that obtained in a 600 MHz magnet (14.1 T).



Example: Calculate the chemical shifts of a sample that contains two signals (140Hz & 430 Hz using 60MHz instrument; 187Hz & 573 Hz using 80MHz instrument). (2.33ppm & 7.17ppm)

Example: The 60MHz ^1H spectrum of CH_3Li shows a signal at 126 Hz upfield of TMS. What is its chemical shift? (-2.10ppm)

➤ **Electron surrounding each nucleus** in a molecule serves to **shield that nucleus** from the applied magnetic field. This shielding effect cause the **DE difference**, thus, different ν will be obtained in the spectrum

$B_{\text{eff}} = B_0 - B_i$ where B_i induced by cloud electron

$B_i = sB_0$ where s is the shielding constant

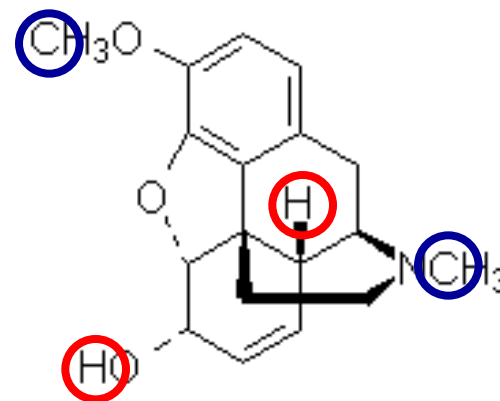
$B_{\text{eff}} = (1-s) B_0$

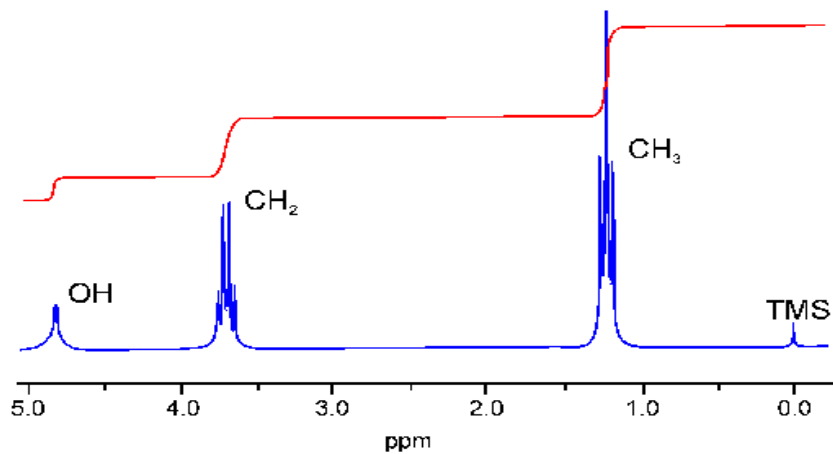
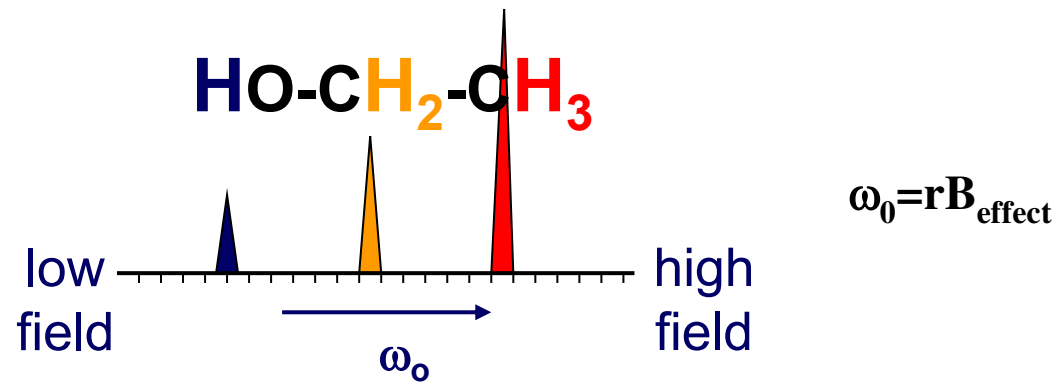
$\nu_{\text{precession}} = (rB_0/2\pi) (1-s)$

$s = 0 \rightarrow$ naked nuclei

$s > 0 \rightarrow$ nuclei is shielded by electron cloud

$s < 0 \rightarrow$ electron around this nuclei is withdraw , i.e. deshielded

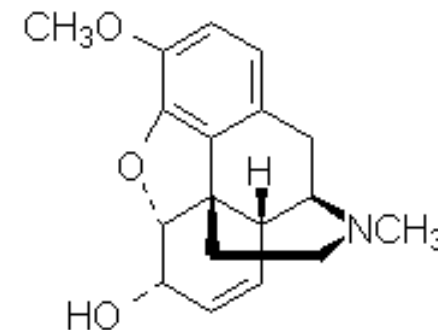
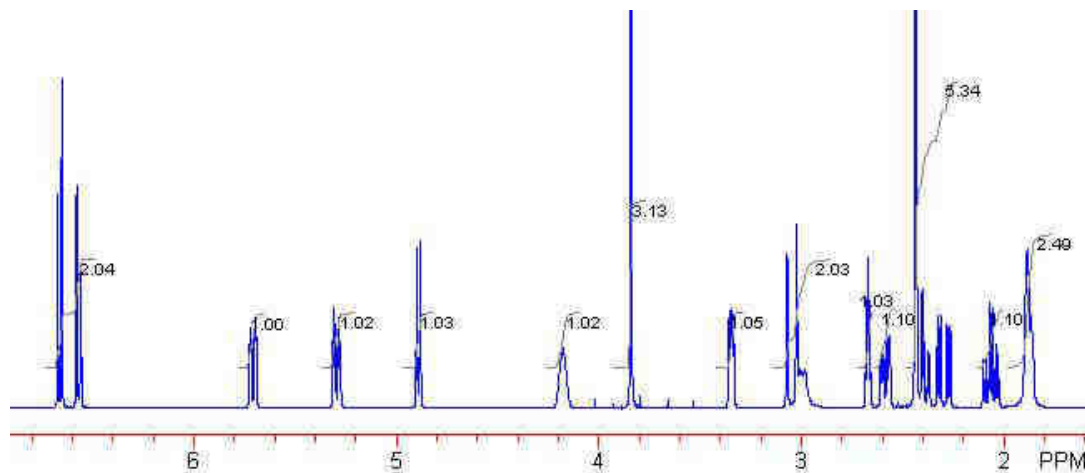




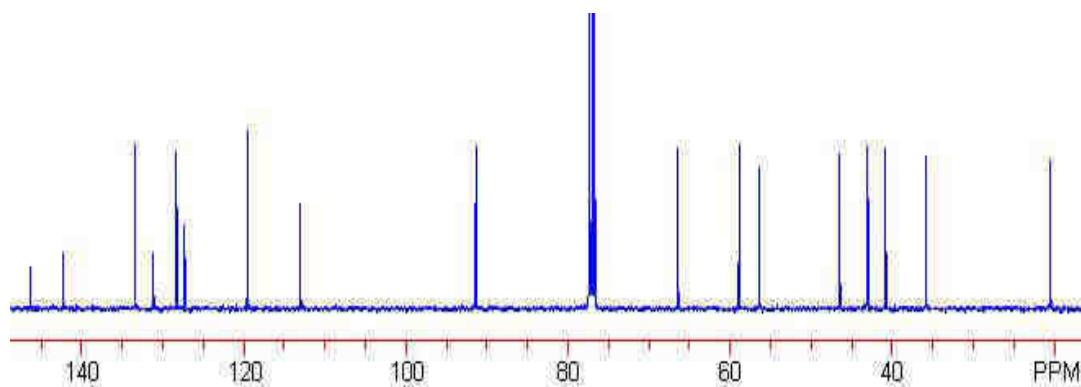
Notice that the intensity of peak is proportional to the number of H

•Example of 1D : ^1H spectra, ^{13}C spectra of Codeine $\text{C}_{18}\text{H}_{21}\text{NO}_3$, MW= 299.4

^1H

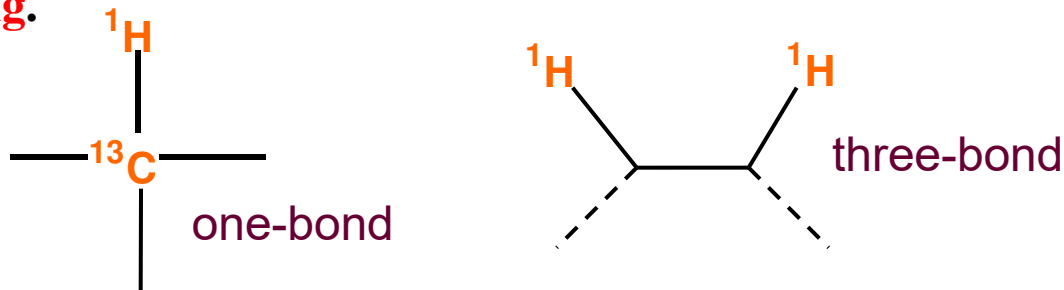


^{13}C

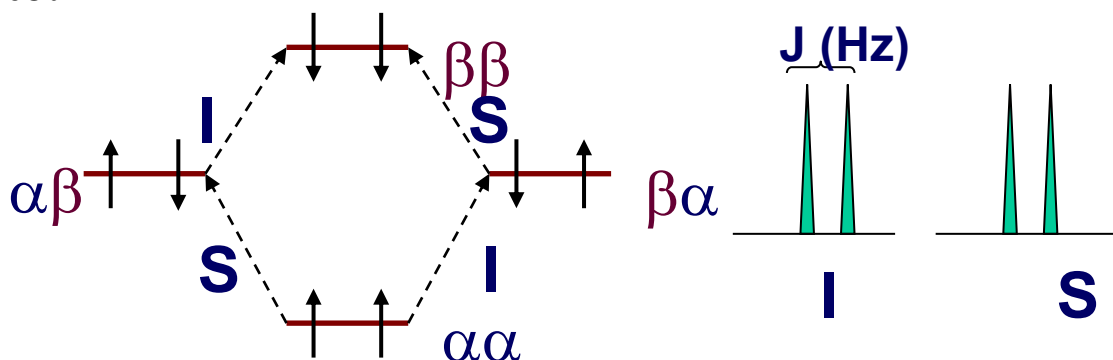


◆ J-coupling

• Nuclei which are close to one another could cause an influence on each other's **effective magnetic field**. If the distance between non-equivalent nuclei is less than or equal to three bond lengths, this effect is observable. This is called **spin-spin coupling** or **J coupling**.



• Each spin now seems to have two energy 'sub-levels' depending on the state of the spin it is coupled to:

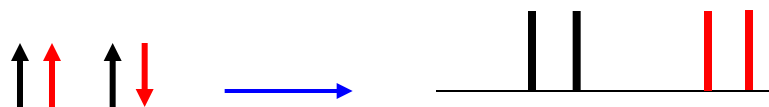


The magnitude of the separation is called *coupling constant* (J) and has units of Hz.

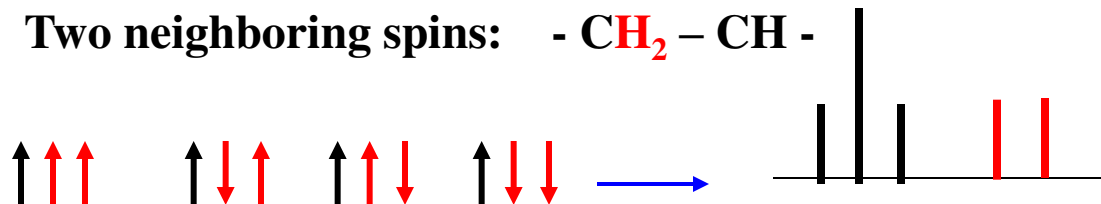
• **N neighboring spins: split into N + 1 lines**



One neighboring spins: - **CH** - CH -



Two neighboring spins: - **CH₂** - CH -

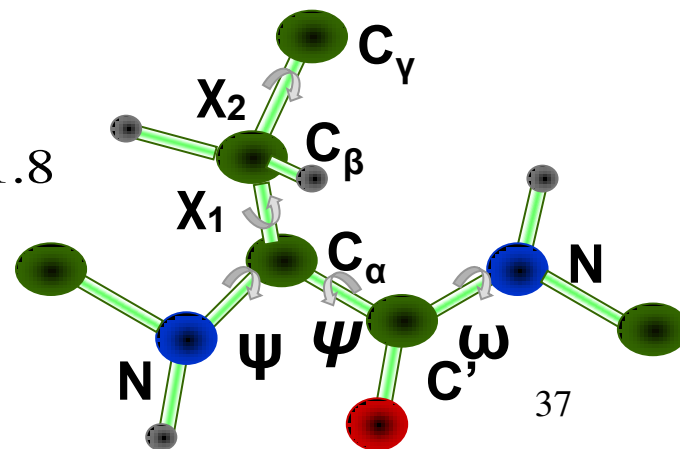


• From *coupling constant* (**J**) information, dihedral angles can be derived (**Karplus equation**)

$${}^3 J_{NH\alpha} = 6.4 \cos^2(\phi - 60) - 1.4 \cos(\phi - 60) + 1.9$$

$${}^3 J_{\alpha\beta 1} = 9.5 \cos^2(\chi_1 - 120) - 1.6 \cos(\chi_1 - 120) + 1.8$$

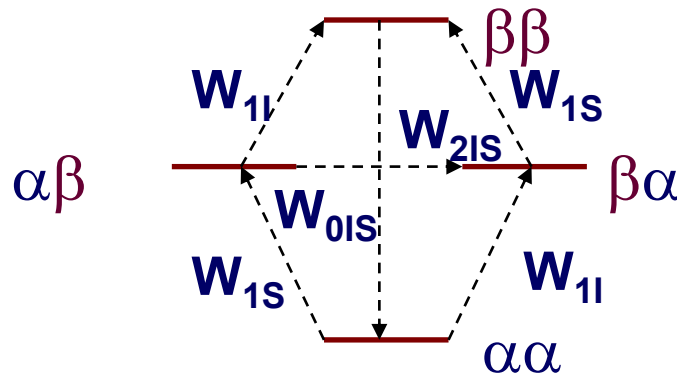
$${}^3 J_{\alpha\beta 2} = 9.5 \cos^2 \chi_1 - 1.6 \cos \chi_1 + 1.8$$



◆ Nuclear Overhauser Effect (NOE)

• The **NOE** is one of the ways in which the system (a certain spin) can release energy. Therefore, it is profoundly related to relaxation processes. In particular, the NOE is related to **exchange of energy between two spins that are not scalarly coupled** ($J_{IS} = 0$), but have **dipolar coupling**.

• The NOE is evidenced by enhancement of certain signals in the spectrum when the equilibrium (or populations) of other nearby are altered. For a two spin system, the energy diagram is as following:

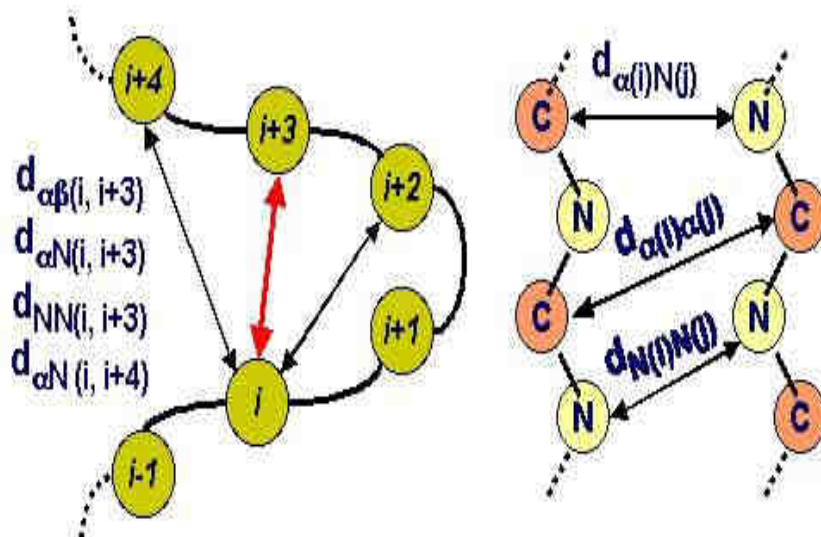


• **W** represents a **transition probability**, or the rate at which certain transition can take place. For example, the system in equilibrium, there would be W_{1I} and W_{1S} transitions, which represents **single quantum transitions**.

- NOE could provide information of distance between two atoms:

$$\text{NOE} / \text{NOE}_{\text{std}} = r_{\text{std}}^6 / r^6$$

- Thus, NOE is very important parameter for structure determination of macromolecules



◆ Relaxation Rates

- The **Bloch Equations**:

$$dM_x(t) / dt = \gamma [M_y(t) * B_z - M_z(t) * B_y] - M_x(t) / T_2$$

$$dM_y(t) / dt = \gamma [M_z(t) * B_x - M_x(t) * B_z] - M_y(t) / T_2$$

$$dM_z(t) / dt = \gamma [M_x(t) * B_y - M_y(t) * B_x] - (M_z(t) - M_0) / T_1$$

- The relaxation rates of the longitudinal magnetization, T1, determine the length of the recycle delay needed between acquisitions, and the relaxation rates T2 determine the line width of the signal.

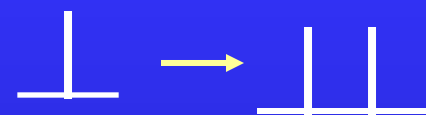
- Relaxation could also provide experimental information on the **physical processes** governing relaxation, including **molecular motions** (dynamics).

NMR Parameters employed for determining protein structure

1. **Chemical Shift Indices:** Determining secondary structure.

2. **J-coupling:** Determine dihedral angles.

(Karplus equation)



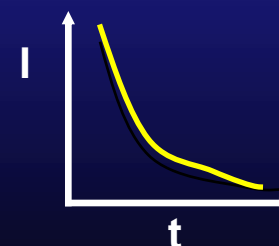
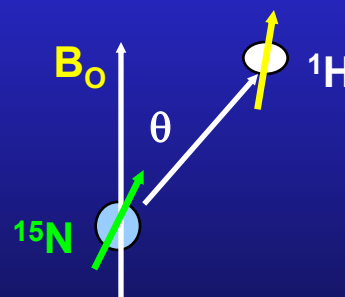
3. **Nuclear Overhauser Effect (NOE):**

Determine inter-atomic distances ($\text{NOE} \propto R^{-6}$)



4. **Residual dipolar coupling:**

Determine bond orientations.



5. **Relaxation rates (T_1 , T_2 etc):**

Determine macromolecular dynamics.

Steps for NMR Experiment

取得樣品

取得NMR圖譜

分析圖譜結果

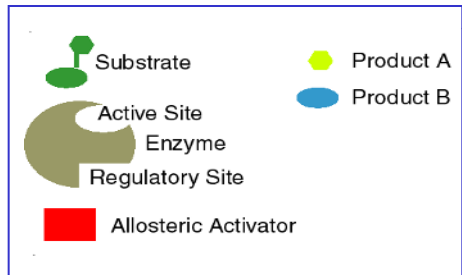
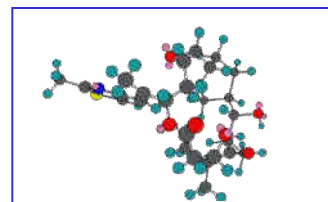
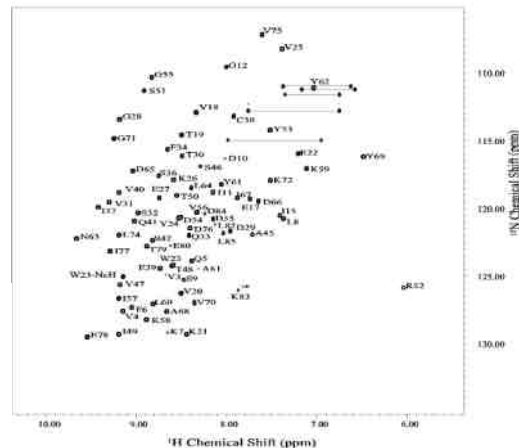
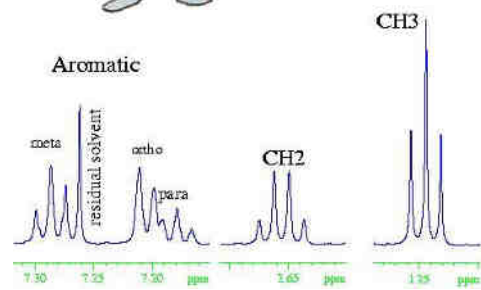


適當的實驗方法

標定NMR譜線

鑑定化學(生化)分子

分子結構、動力學、
反應機制……



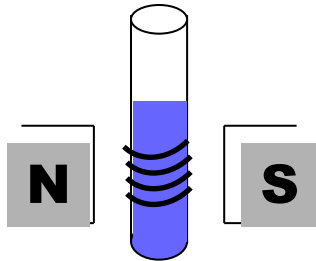
Preparation for NMR Experiment

1. Sample preparation (準備適當之樣品條件)

Which buffer to choose? Isotopic labeling?

Best temperature?

Sample Position ?



2. What's the nucleus or prohead? (選擇合適之探頭)

A nucleus with an even mass A and even charge Z → nuclear spin I is zero

Example: ^{12}C , ^{16}O , ^{32}S → No NMR signal

A nucleus with an even mass A and odd charge Z → integer value I

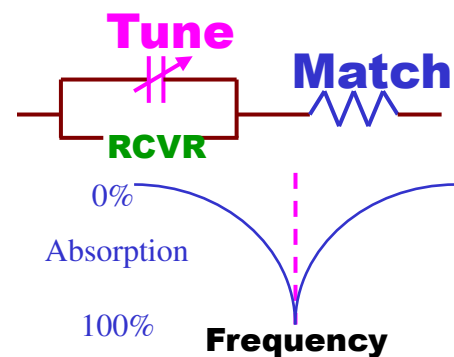
Example: ^2H , ^{10}B , ^{14}N → NMR detectable

A nucleus with odd mass A → $I=n/2$, where n is an odd integer

Example: ^1H , ^{13}C , ^{15}N , ^{31}P → NMR detectable

3. The best condition for NMR Spectrometer? (調整硬體狀態)

→ Wobble : Tune & Match & Shimming

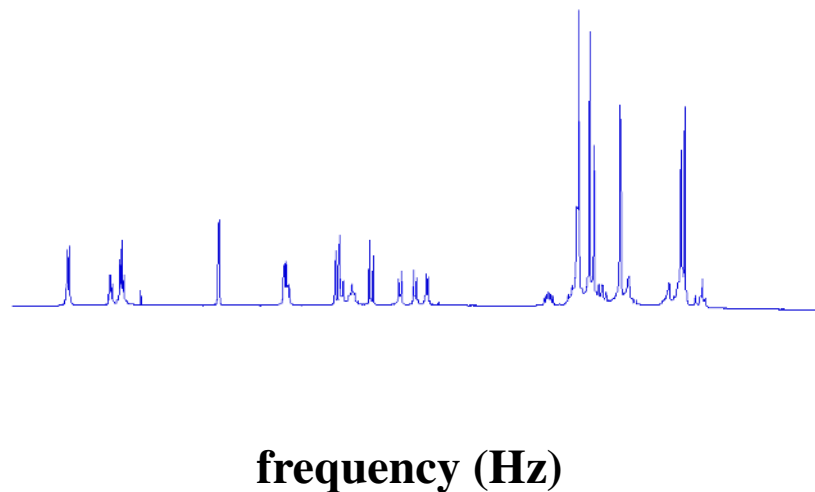
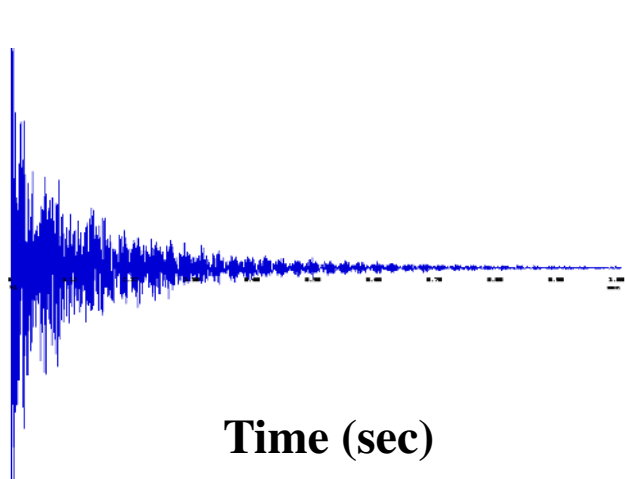
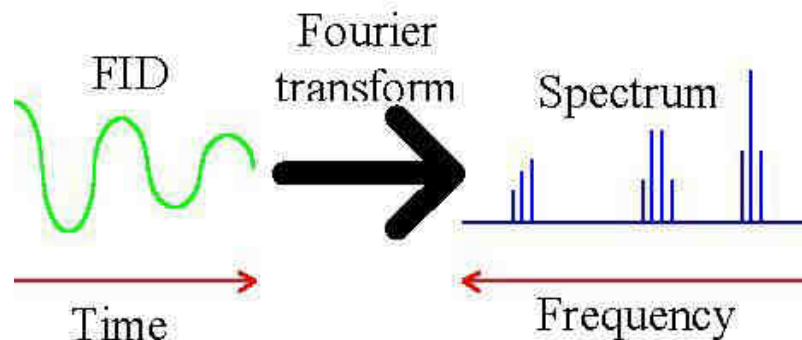


4. What's the goal? → Which type of experiment you need? (選擇合適之實驗方法)

Different experiments will result in different useful information

5. NMR Data Processing

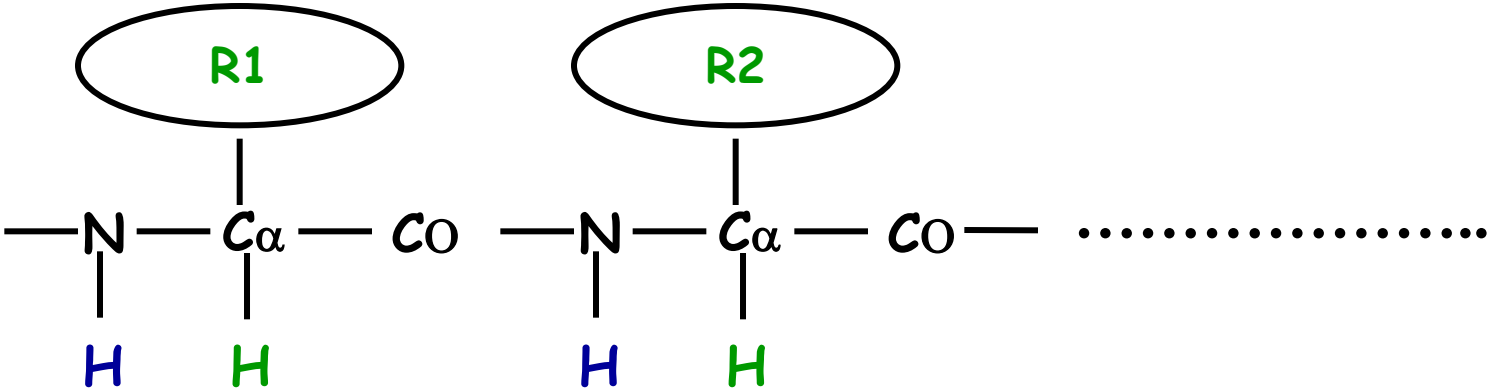
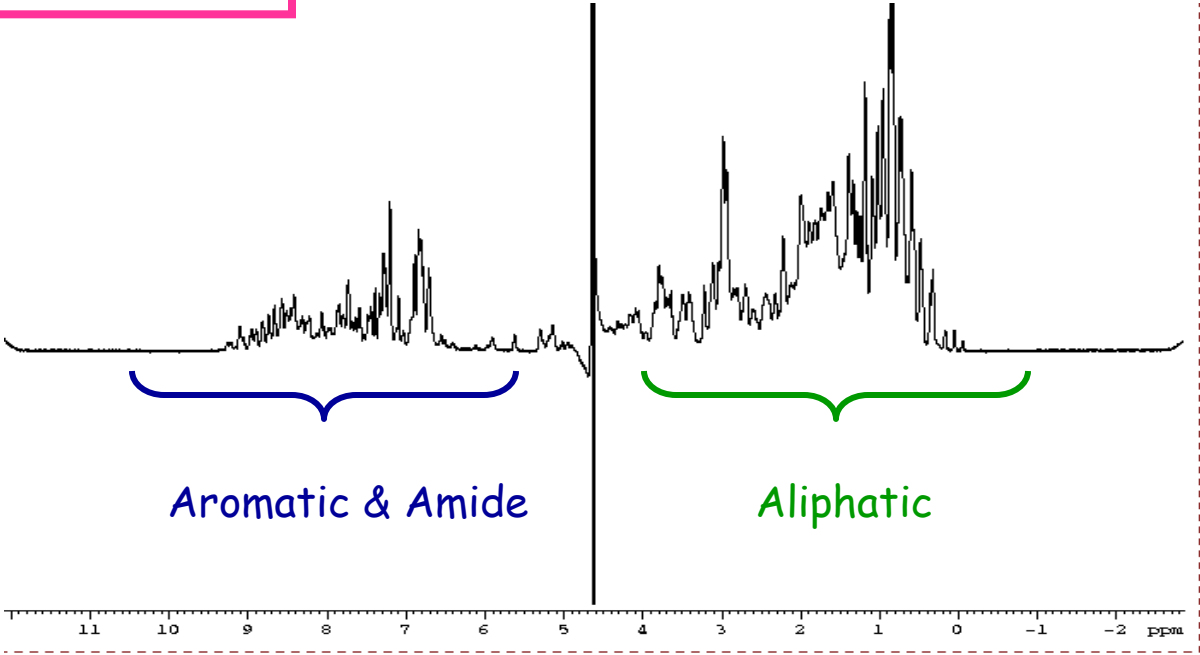
- The FID (free induction decay) is then **Fourier transform** to frequency domain to obtain ν_{prossion} (chemical shift) for each different nuclei.



Types of NMR Experiments

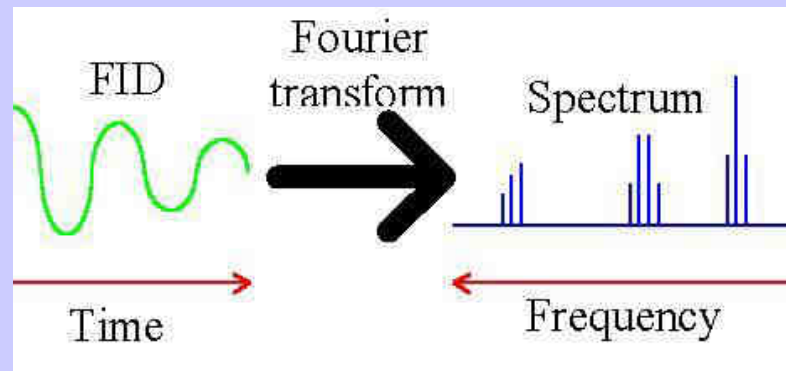
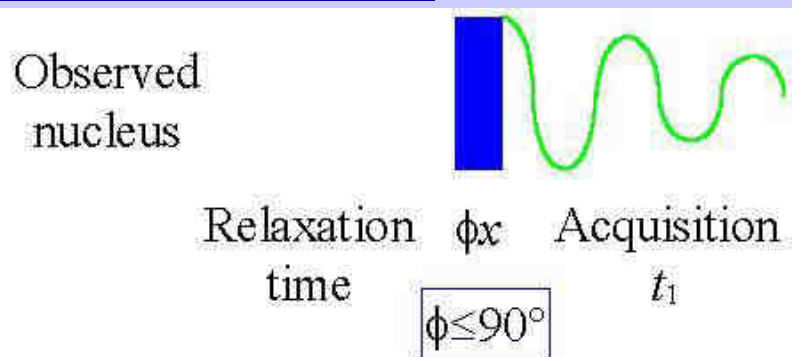
Homo Nuclear 1D NMR

1D one pulse 1H

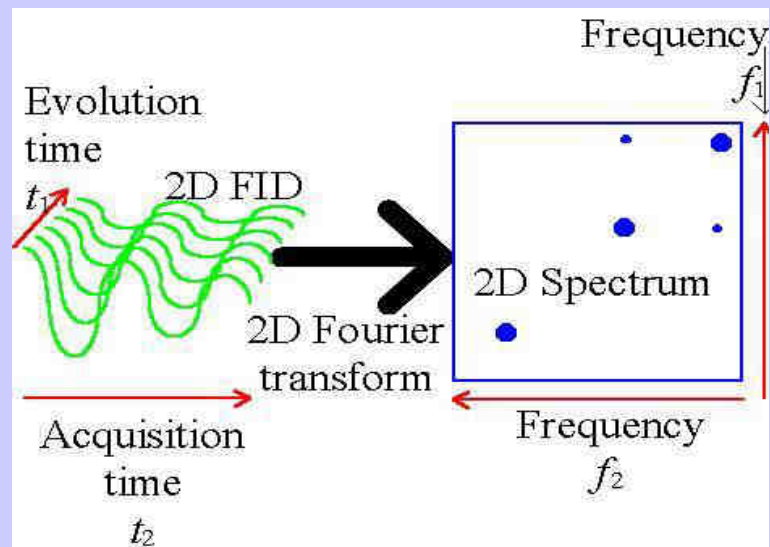
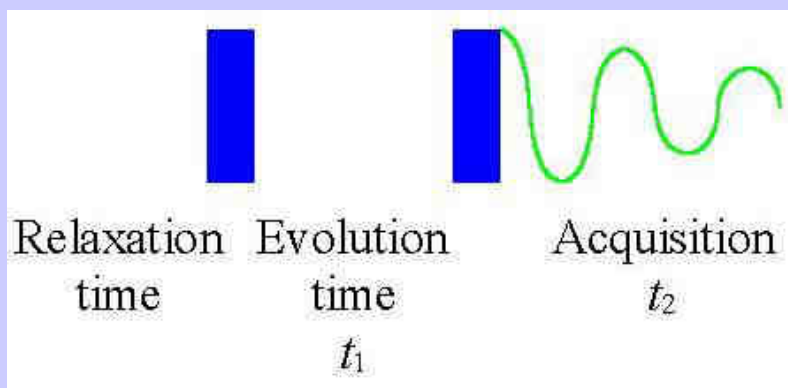


Homo/Hetero Nuclear 2D NMR

Basic 1D Experiment

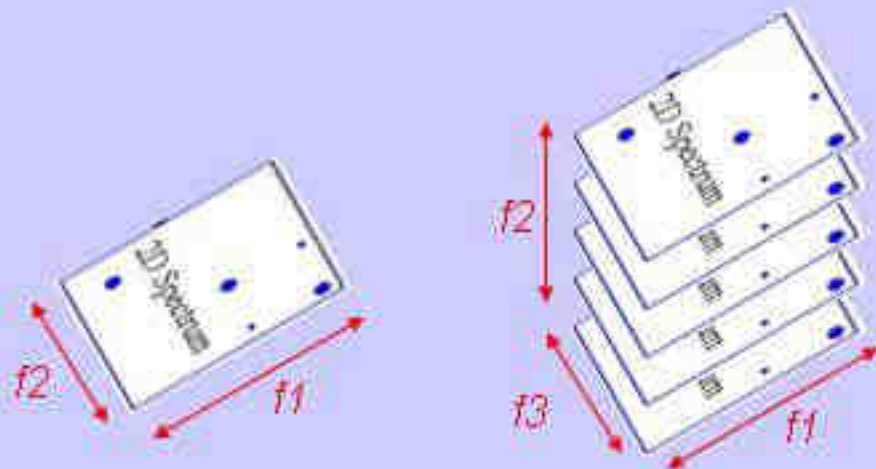
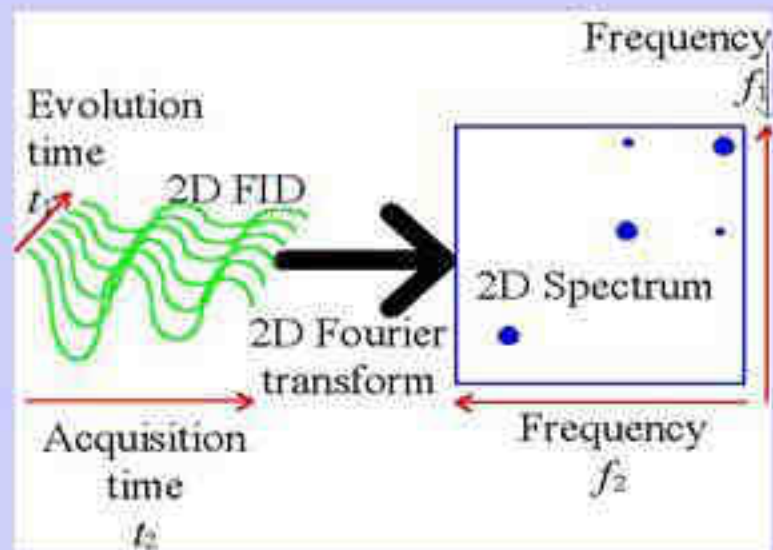
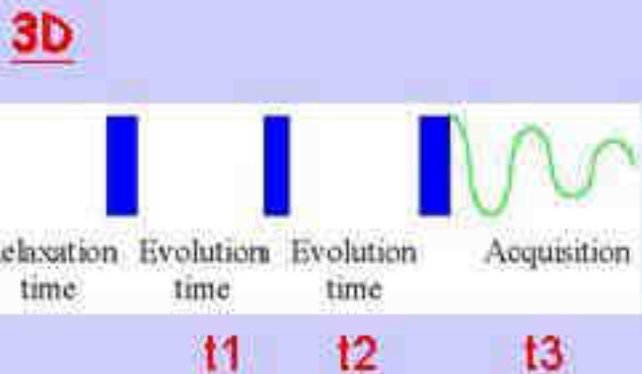
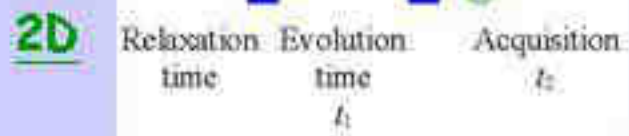
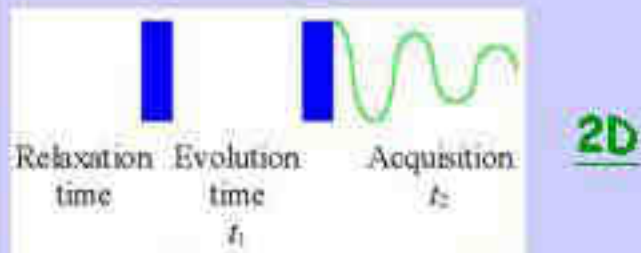


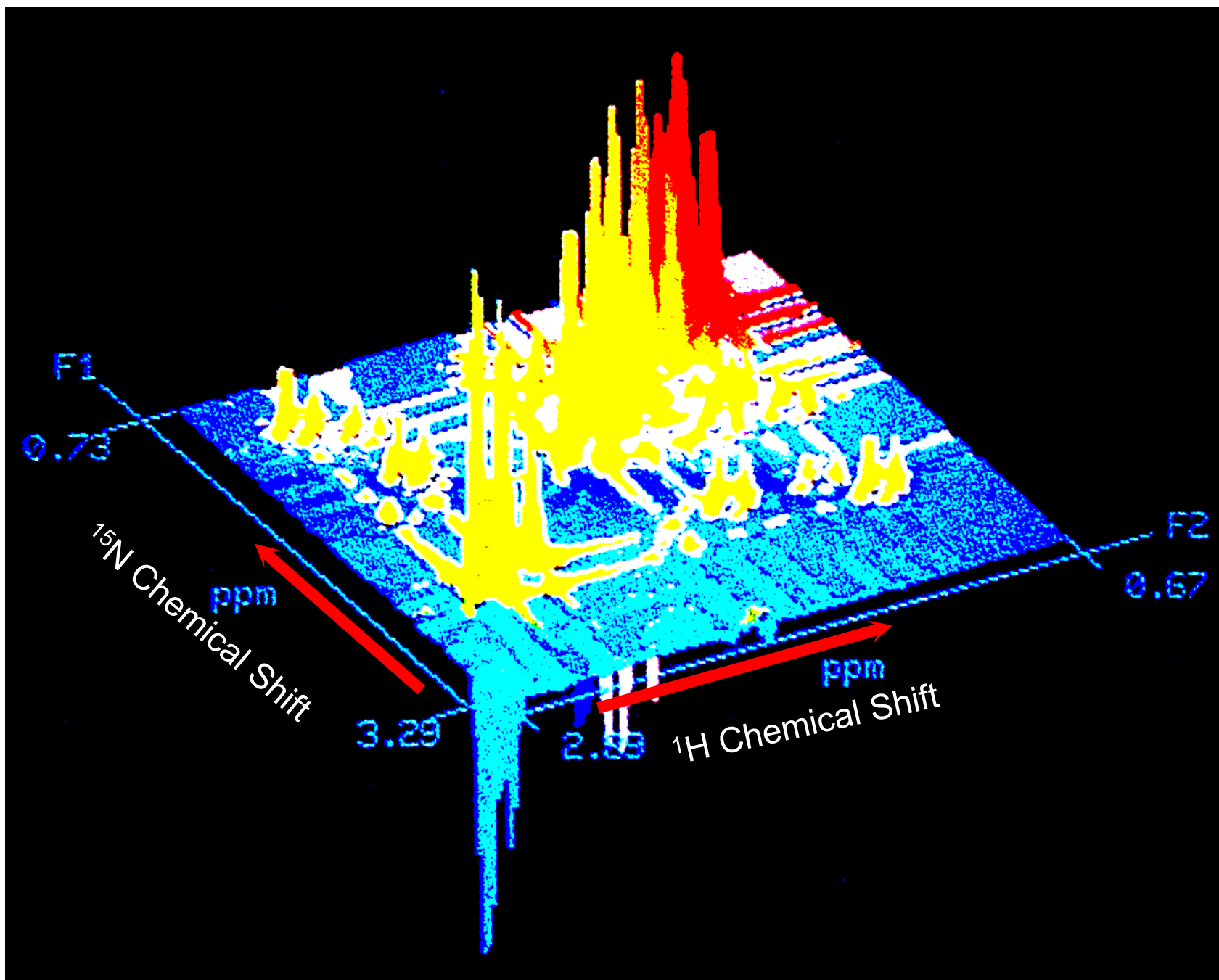
Basic 2D Experiment

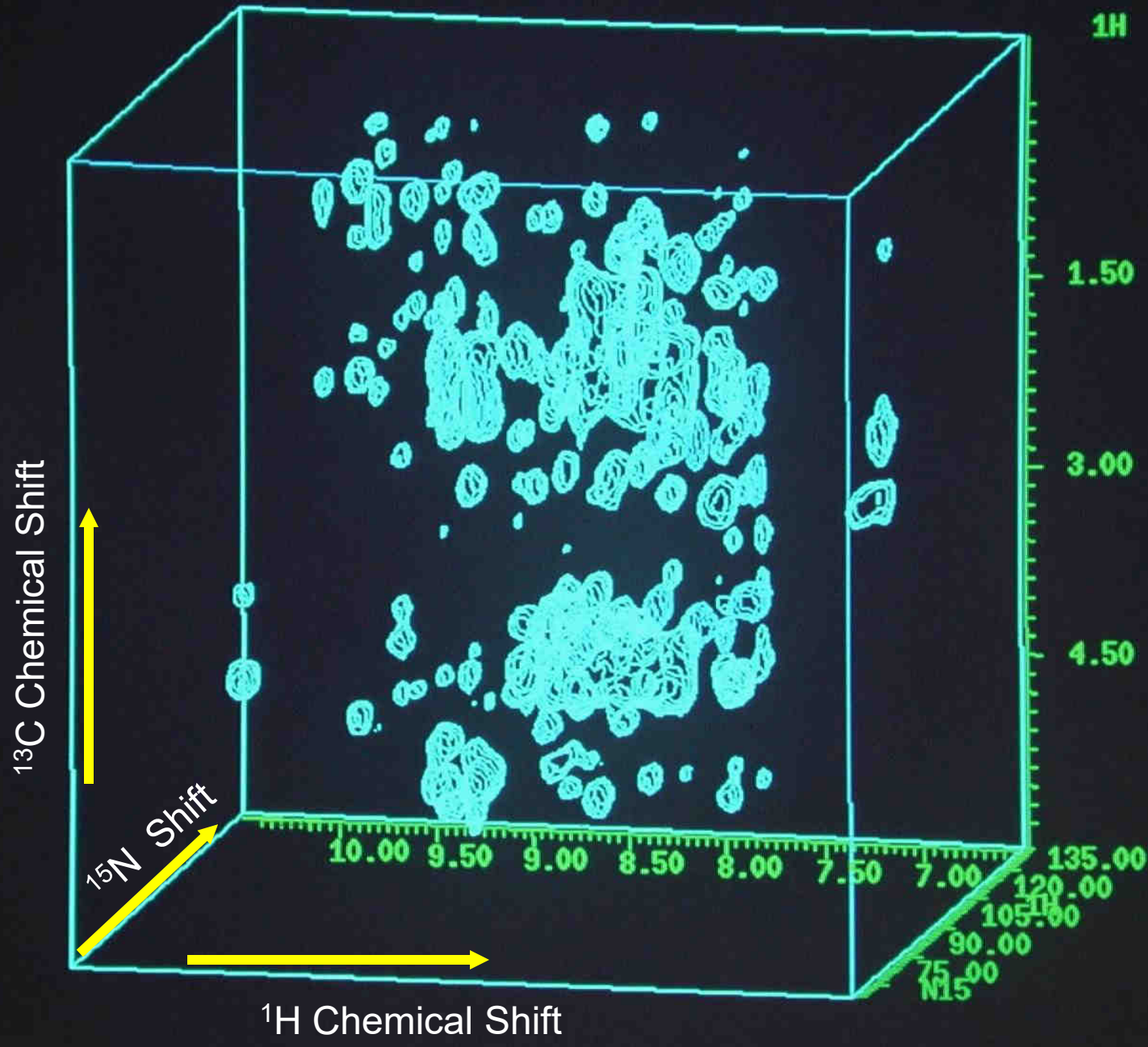


Multi-Dimensional NMR

Basic 3D Experiment







TOPIC:DEVELOPMENTAL BIOLOGY

Dr.Gajanan K Sontakke

Assistant professor,

Department of zoology,

Smt.Meenalben Mehta College,Panchgani



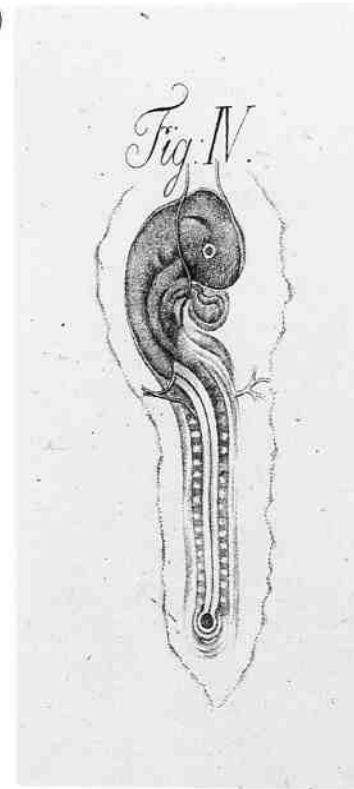
Developmental Biology

An Introduction

Animal Development

- How has the study of development changed?

(c)

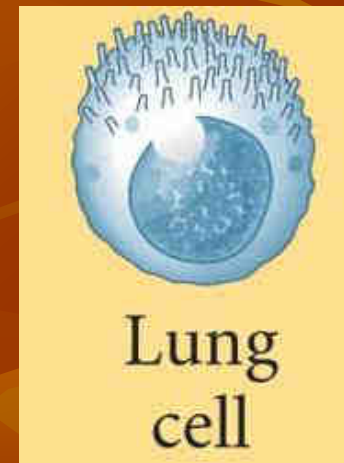
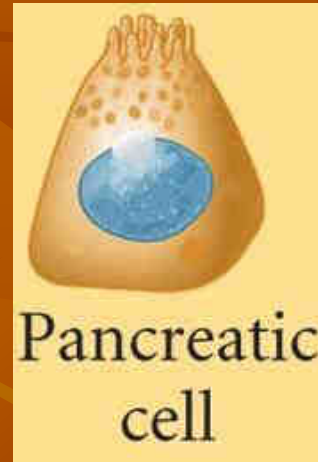


Animal Development

What kinds of questions are developmental biologists asking?

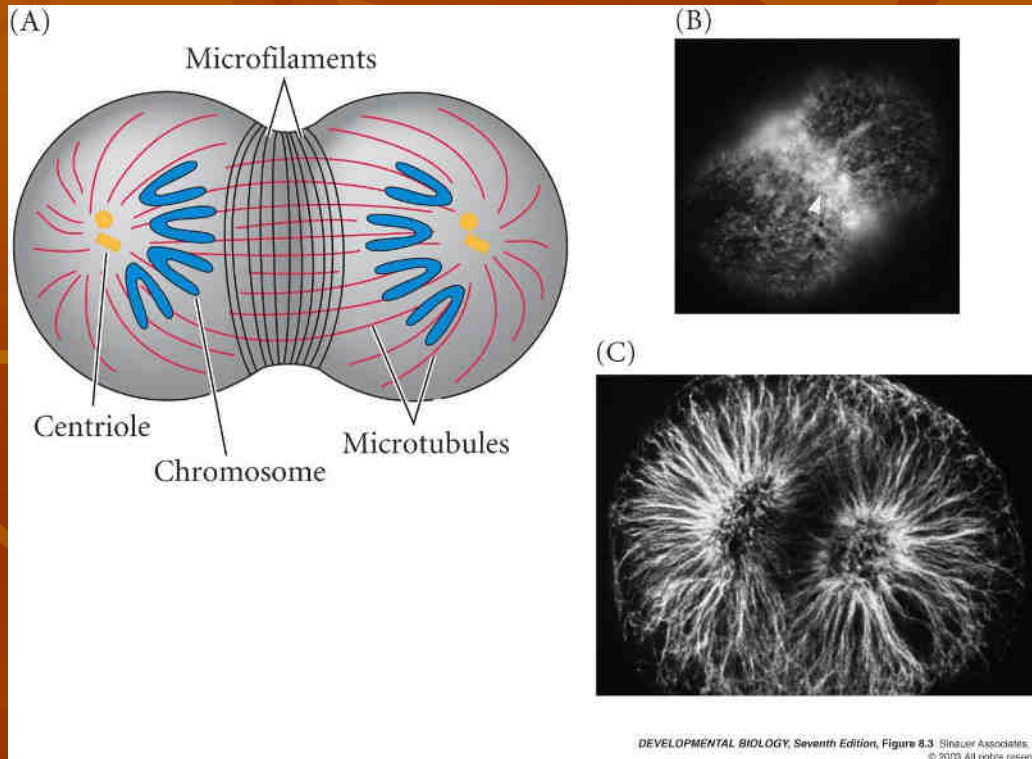
Animal Development

How does the same genetic information result in different types of cells?



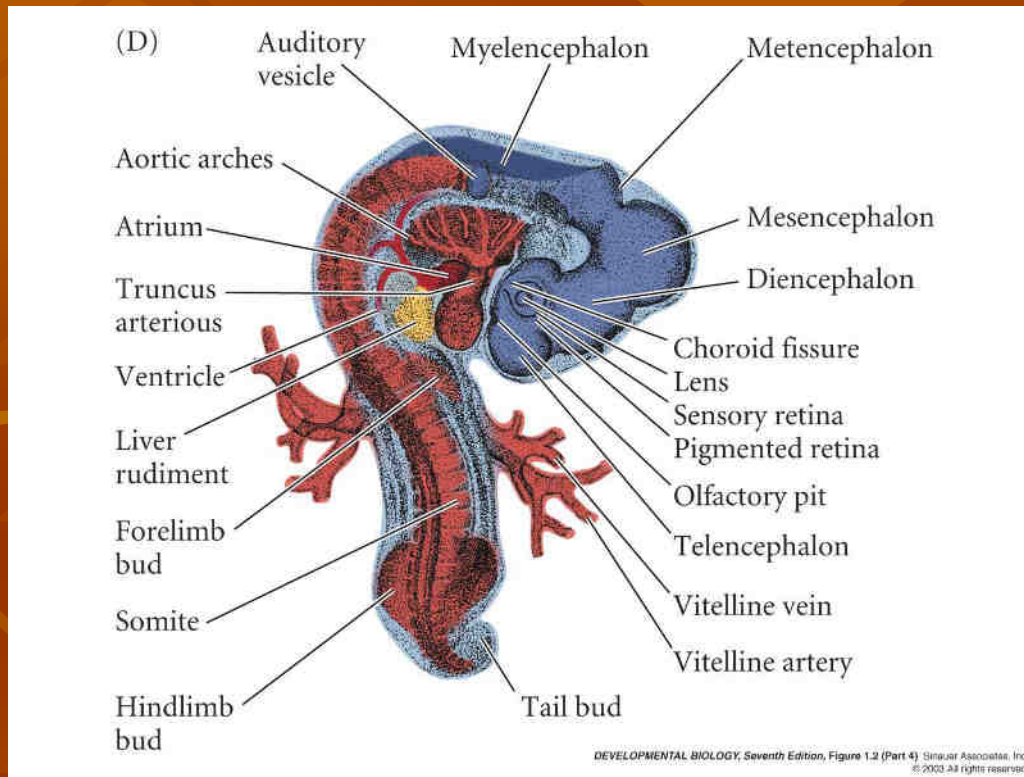
Animal Development

- How is cell division regulated?



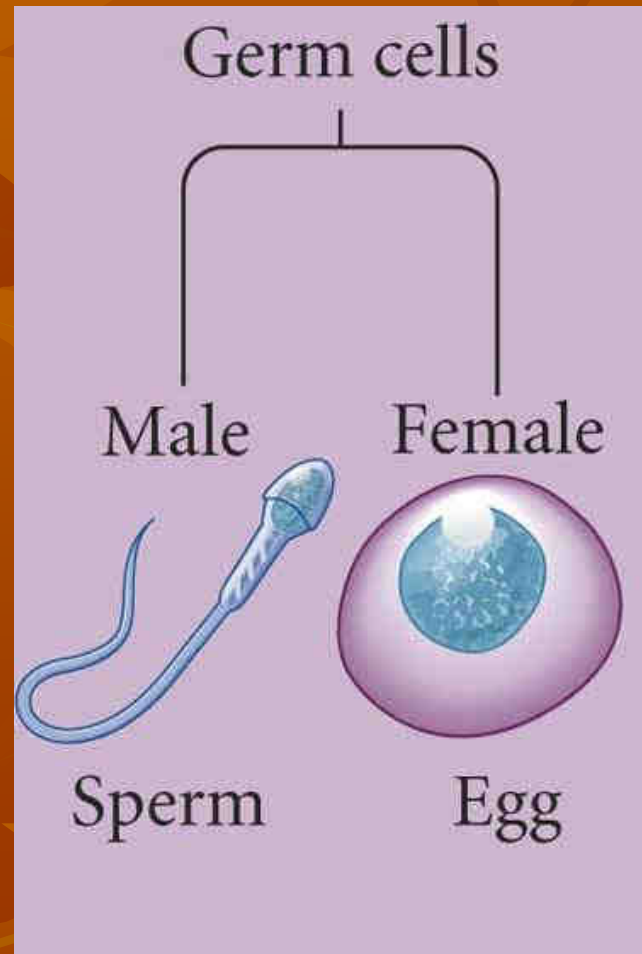
Animal Development

- How do cells form ordered structures?



Animal Development

- How are reproductive cells set apart?



Animal Development

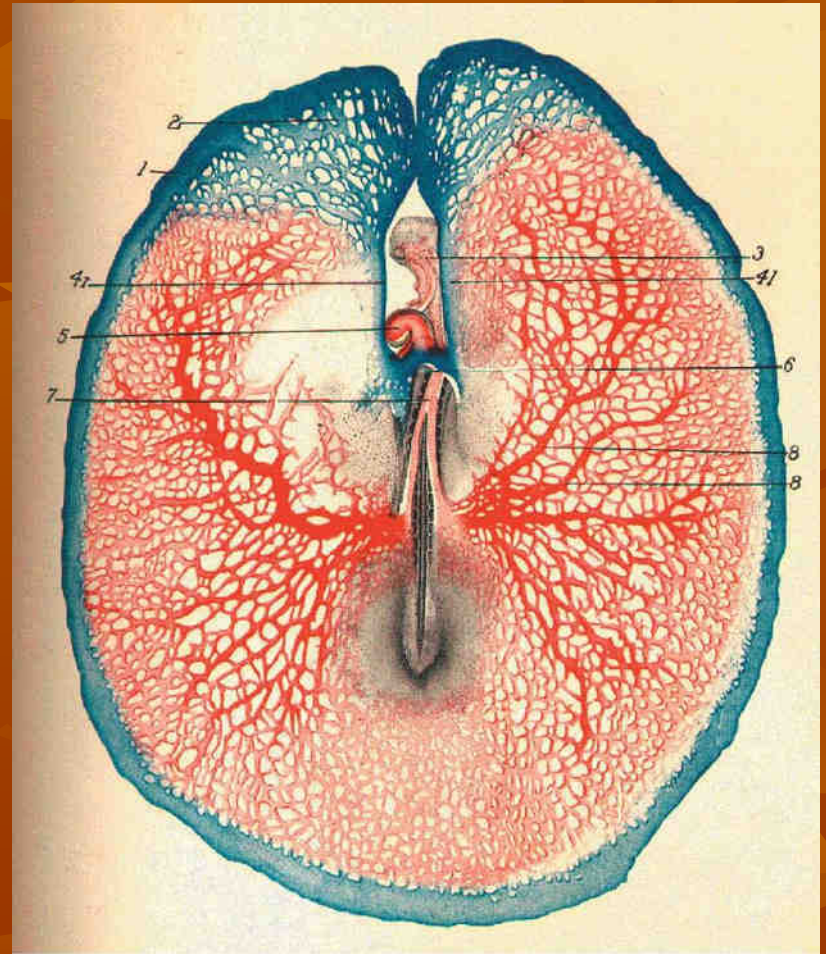
How do changes in development create new body forms and what changes are possible?

Animal Development

- How do each of these contribute to the study of development?
 - comparative embryology
 - evolutionary embryology
 - teratology
 - mathematical modeling

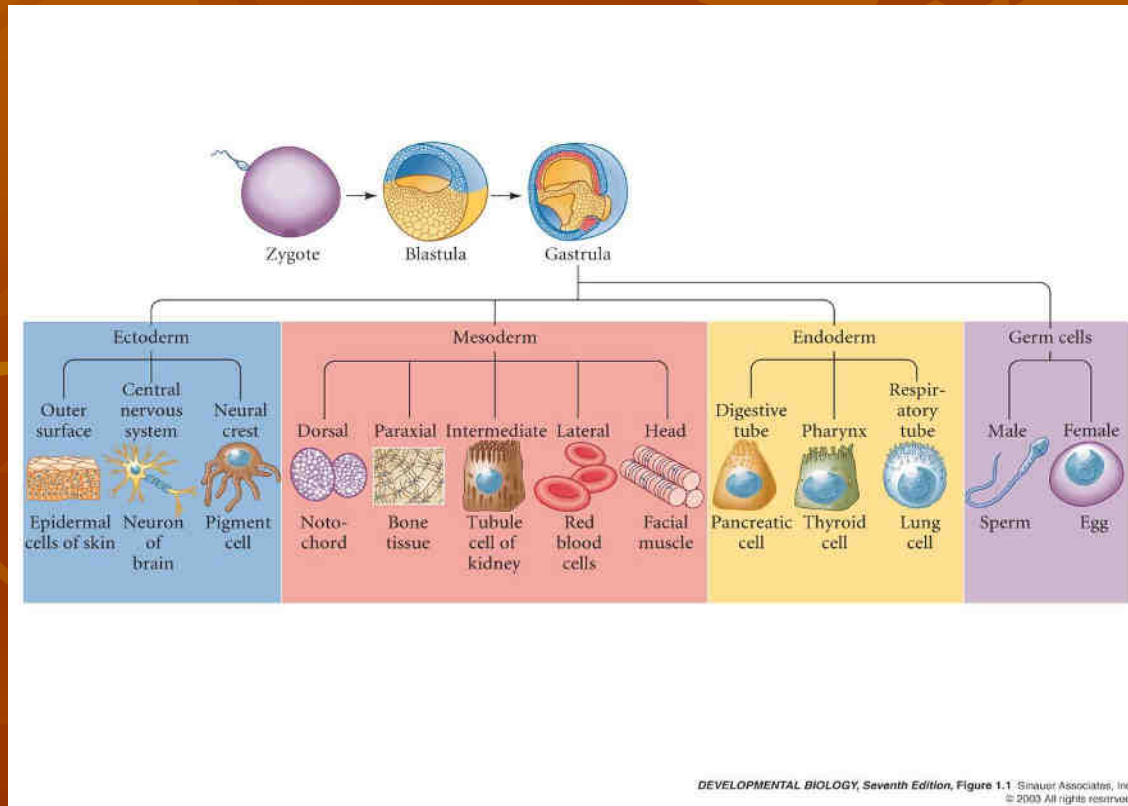
Comparative Embryology

- Epigenesis versus preformation



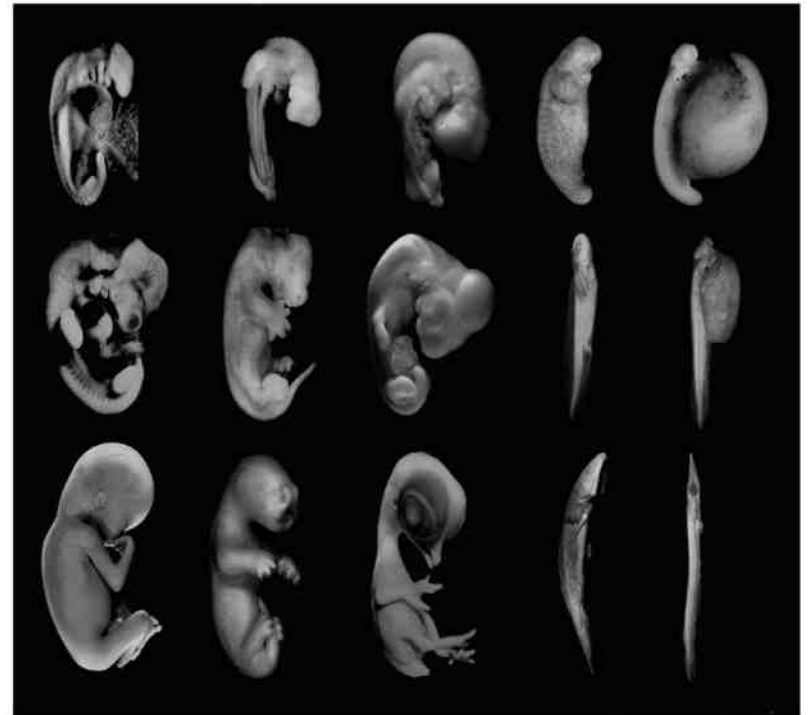
Comparative Embryology

- How does the concept of germ layers support epigenesis?
- How does the concept of induction fit in here?



Comparative Embryology

- What principles did von Baer articulate with respect to vertebrate development?



Human Opossum Chicken Salamander
(axolotl) Fish
(gar)

Comparative Embryology

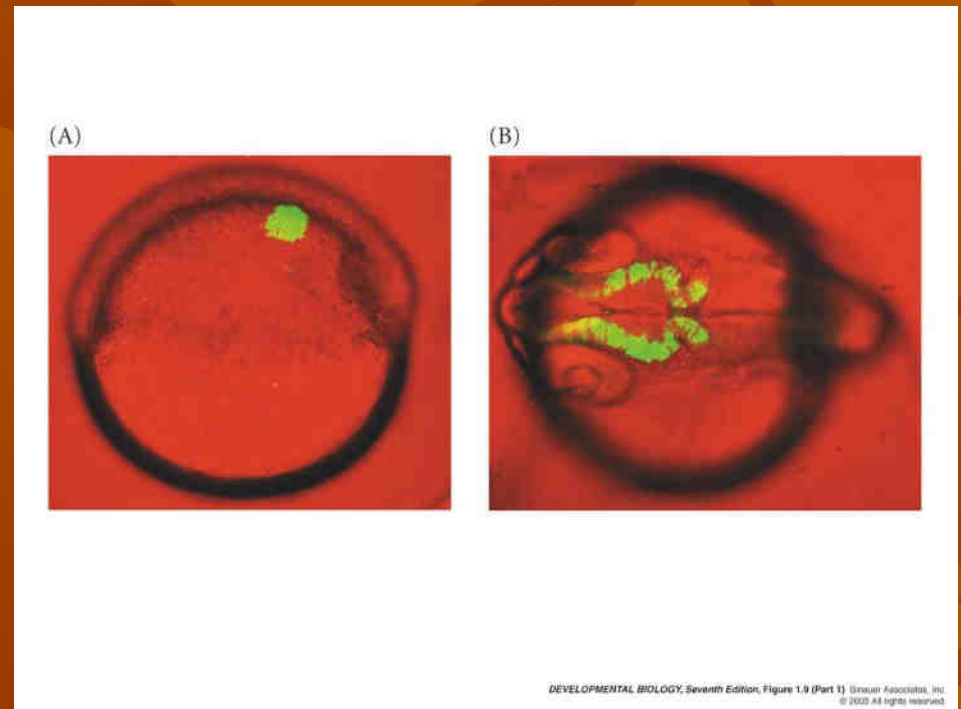
- General features of large group of animals appear earlier than specialized features of smaller group
- Less general characteristics develop from more general

Comparative Embryology

- A particular type of embryo, instead of passing through adult stages of a lower form, departs more and more from it.
- Embryo of higher animal is only like early embryo of lower animal.

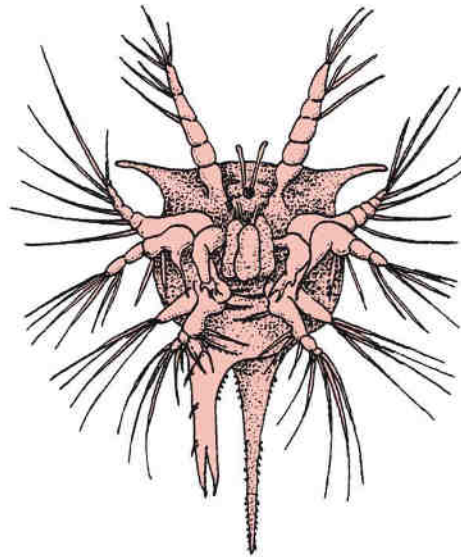
Comparative Embryology

- How have fate maps contributed to our understanding of development?

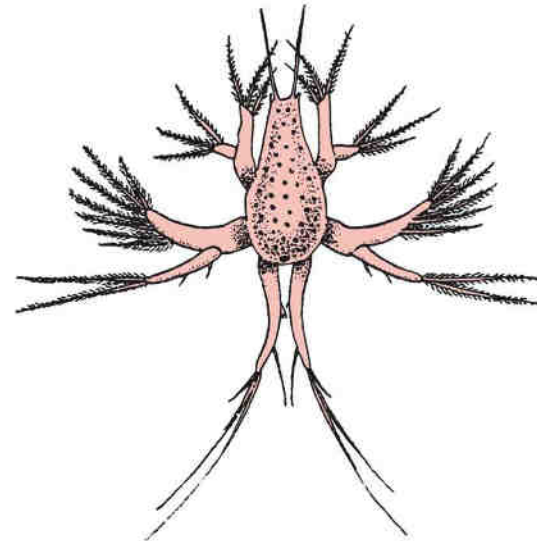


Evolutionary Embryology

- How have observations of embryos contributed to our understanding of evolutionary relationships?



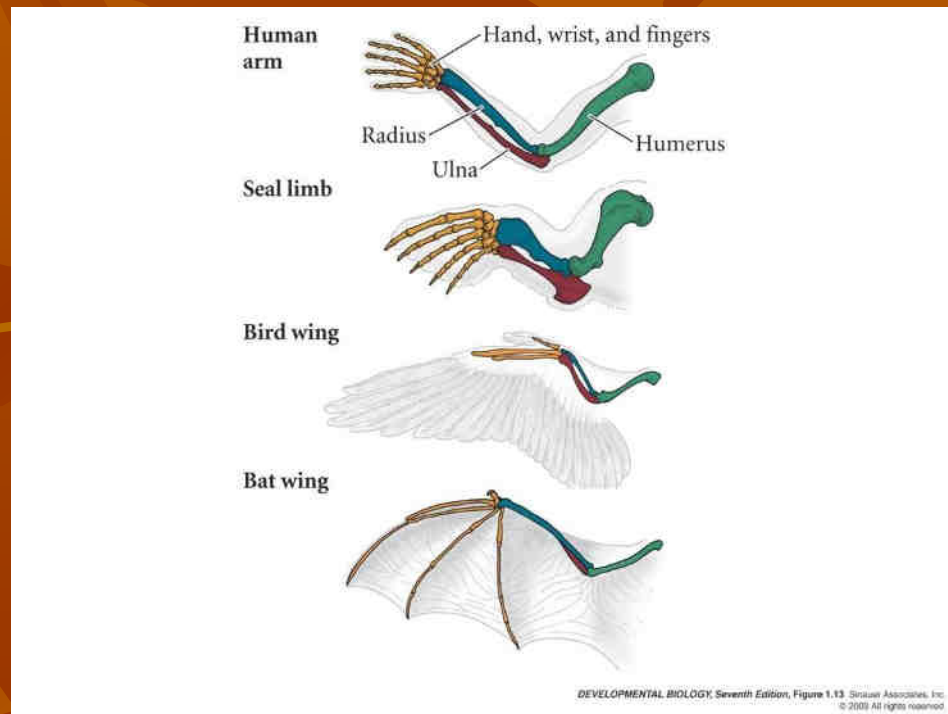
(A) *Tetracelula*



(B) *Penaeus*

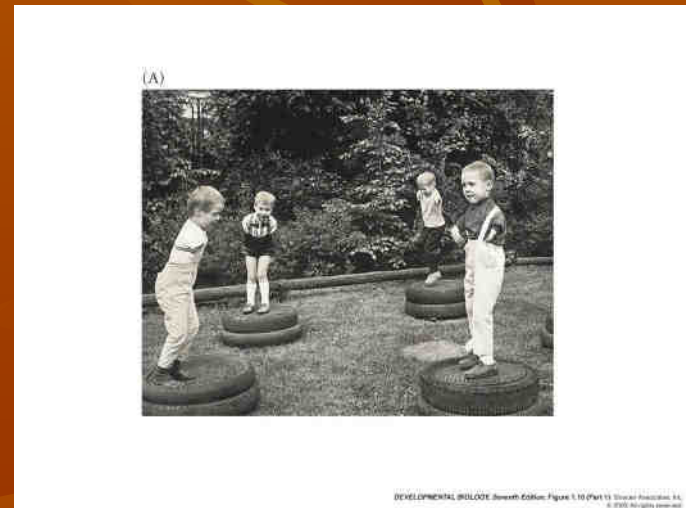
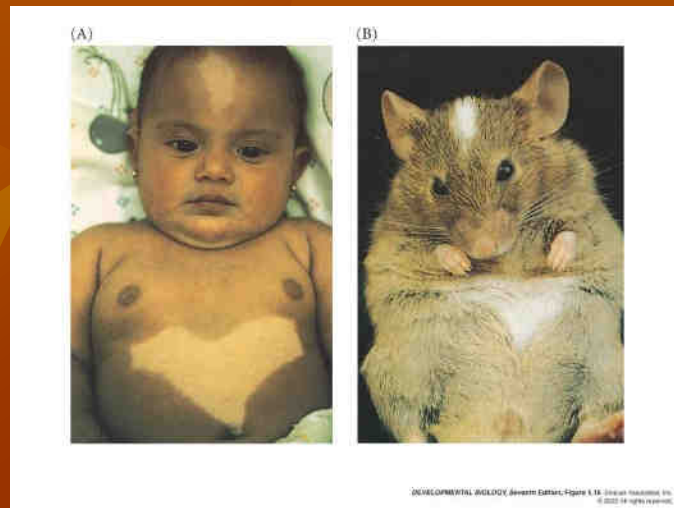
Evolutionary Embryology

- Why is the distinction between analogous and homologous structures important?



Teratology

How are malformations different from disruptions?



Mathematical Modeling

- What's the difference between isometric and allometric growth?

(A)

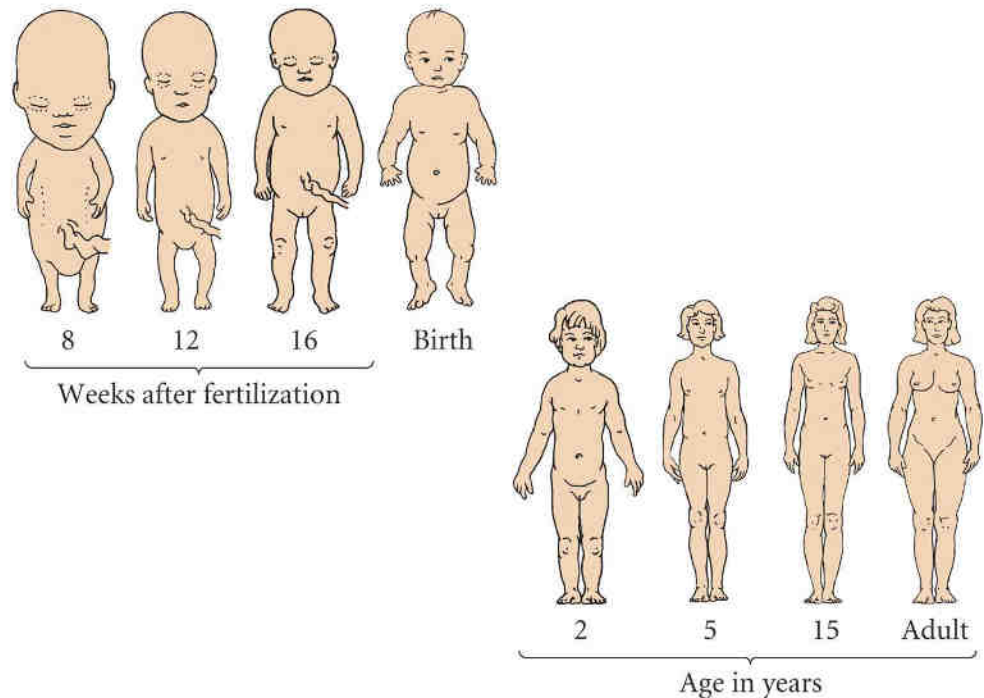


Figure 1.20(1) *Reaction-diffusion System of Pattern Generation*

(A)

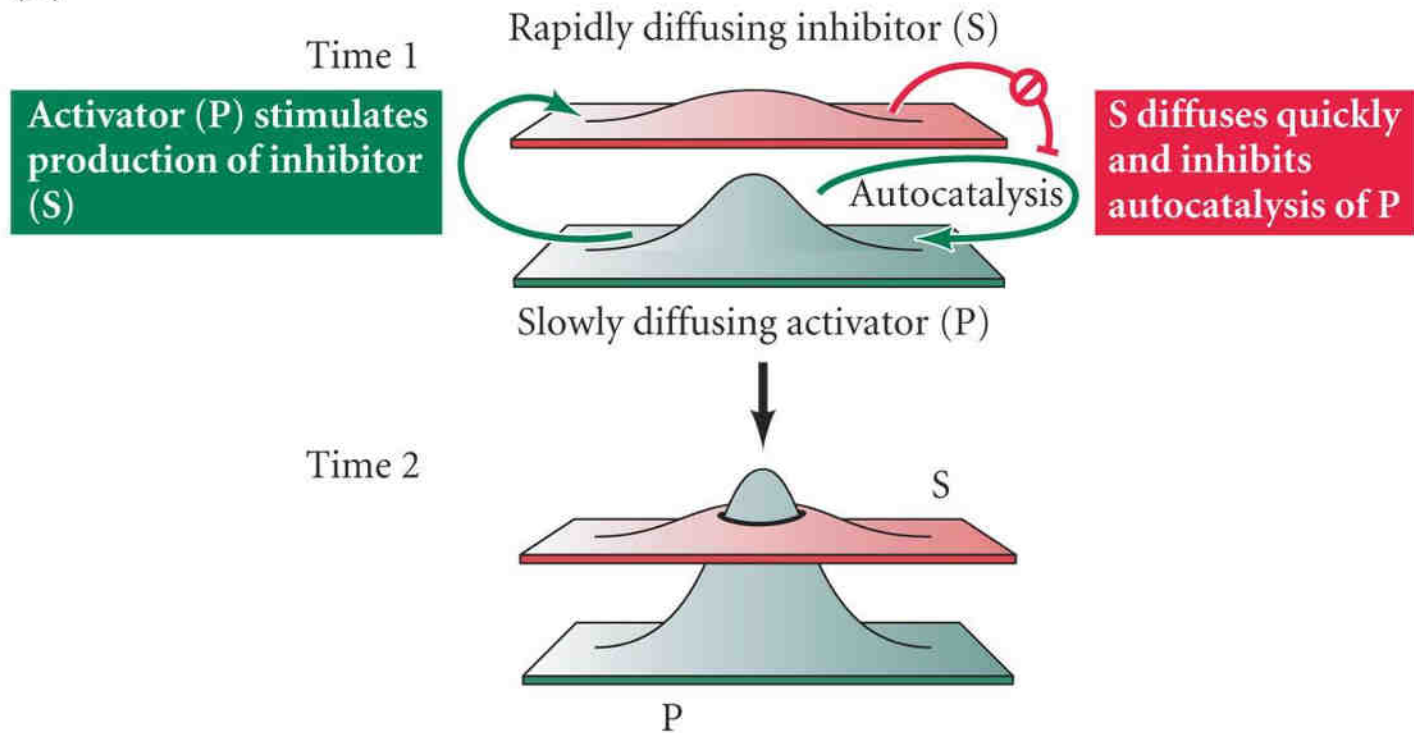
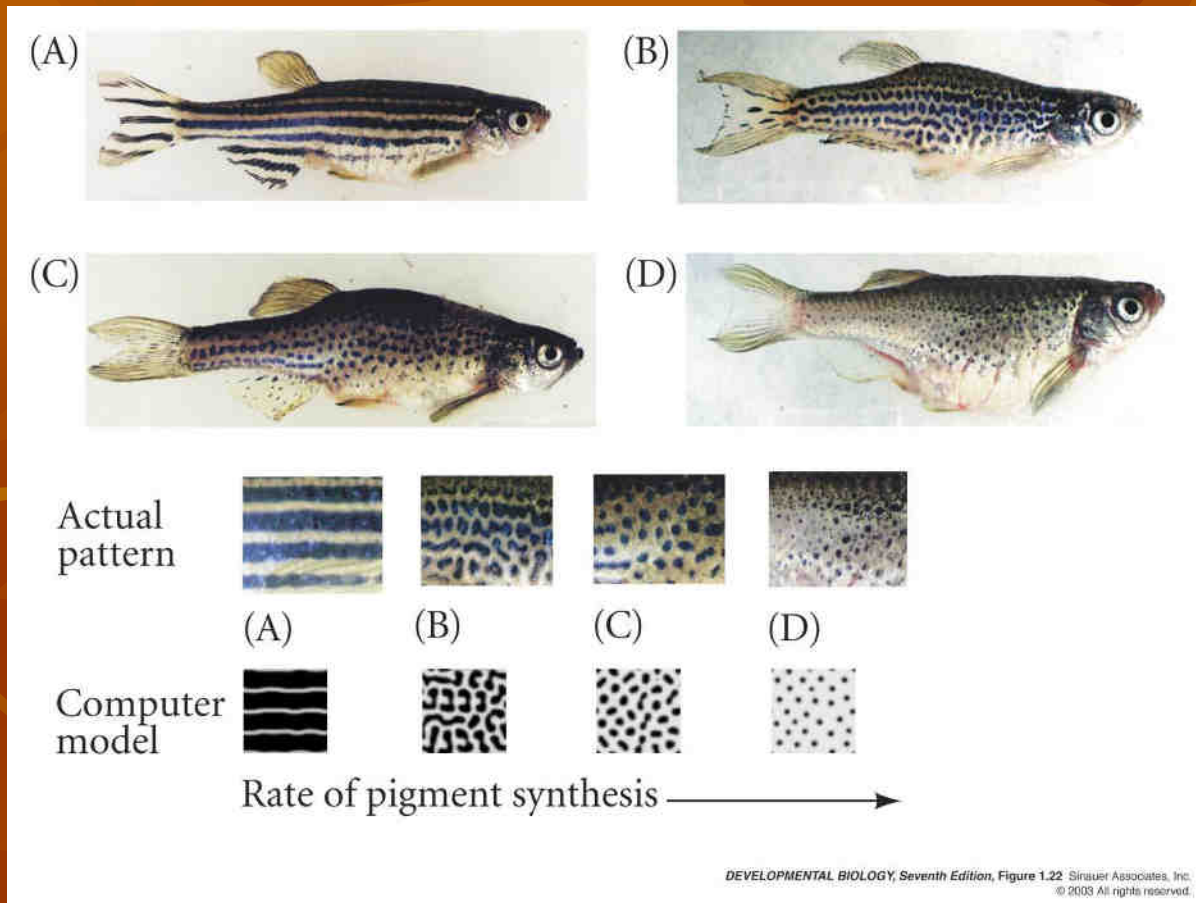


Figure 1.22 Pigment patterns of zebrafish homozygous for the wild-type allele (A) and for three different mutant alleles (B–D) of the leopard gene



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Topic – Linear Differential Equation
Presented By – Dr. S. M. Pawar

DIFFERENTIAL EQUATION:

A Differential Equation is an equation containing the derivative of one or more dependent variables with respect to one or more independent variables.

For example –

$$1) \frac{dy}{dx} = 2xy,$$

$$2) x \frac{dy}{dx} = y-1$$

$$3) \frac{d^2y}{dx^2} + \frac{dy}{dx} + y = 0$$

$$4) \frac{dy}{dx} + \frac{dy}{dx} + 2 = 0$$

$$5) \frac{d^2u}{dt^2} + \frac{d^2u}{dt^2} = 2 \frac{du}{dt}$$

Order of Differential Equation:

The order of highest order derivative contained in a differential equation is called the order of the differential equation.

Example : 1) $dy = (x + \sin x)dx$

Order = 1

2) $\frac{d^4x}{dt^4} + \frac{d^2x}{dt^2} + \left(\frac{dx}{dt}\right)^5 = e^t$

Order = 4

Degree of Differential Equation :

The degree of a differential equation is the degree of the highest order derivative occurs in it.

Example : 1) $\left(\frac{dy}{dx}\right)^2 + y^2 = x^2$

Degree = 2

2) $\frac{d^4x}{dt^2} + \frac{d^2x}{dt^2} + \left(\frac{dx}{dt}\right)^5 = e^t$

Degree = 1

Linear Differential Equations:

A differential equation is said to be linear when the dependent variable and its derivatives appear only in the first degree.

A linear differential equation of the first order is of the form

$$\frac{dy}{dx} + Py = Q$$

Where P & Q are functions of x or constants only.

The solution of the differential equation:

$$\frac{dy}{dx} + Py = 0$$

$$\text{i.e. } \frac{dy}{y} + Pdx = 0 \text{ is } y = ce^{-\int Pdx}$$

$$ye^{\int Pdx} = c \text{ ----- (2)}$$

Differentiating the equation (2), We get,

$$e^{\int Pdx} (dy + Pydx) = 0$$

This shows that $e^{\int Pdx}$ is an integrating factor of equation (1) as Q is a function of x alone.

The solution of Linear differential equation:

$$\frac{dy}{dx} + Py = Q \quad \dots\dots\dots(1)$$

Multiplying both sides of (1) by integrating factor $e^{\int Pdx}$, we get

$$e^{\int Pdx} \left(\frac{dy}{dx} + Py \right) = e^{\int Pdx} Q$$

$$\frac{d}{dx} [y e^{\int Pdx}] = Q \cdot e^{\int Pdx}$$

Integrating both sides w.r.t. x, we get

$$y e^{\int Pdx} = \int Q \cdot e^{\int Pdx} \cdot dx + c \quad \dots\dots\dots(2)$$

Thus, the solution of the linear equation is

$$Y(I.F.) = \int Q \cdot (I.F.) dx + c$$

Where I.F. = $e^{\int P dx}$

Remark : The linear equation is of the form $\frac{dx}{dy} + Rx = S$, where R and S are functions of y only.

In this case solution is of the form

$$X(\text{I.F.}) = \int S \cdot (\text{I.F.}) dy + c$$

Where I.F. = $e^{\int R dx}$

Ex. 13 : Solve $\frac{dy}{dx} + \frac{4x}{1+x^2}y = \frac{1}{(1+x^2)^3}$

Sol. : Here in usual notations,

$$P = \frac{4x}{1+x^2}, \quad Q = \frac{1}{(1+x^2)^3}$$

$$\text{I. F.} = e^{\int P dx} = e^{\int -\frac{4x}{1+x^2} dx} = e^{-2 \int \frac{2x}{1+x^2} dx}$$

$$= e^{-2 \log(1+x^2)} = e^{\log(1+x^2)^2} = (1+x^2)^2$$

\therefore The required solution is

$$y(\text{I.F.}) = \int Q(\text{I.F.}) dx + c$$

$$\therefore y(1+x^2)^2 = \int \frac{1}{(1+x^2)^3} \times (1+x^2)^2 dx + c$$

$$\text{i.e. } y(1+x^2)^2 = \int \frac{dx}{1+x^2} + c$$

$$\therefore y(1+x^2)^2 = \tan^{-1}x + c$$

Ex. 14 : Solve $(1+x^2)\frac{dy}{dx} + 2xy = \cos x$

Sol. : Given equation can be written as

$$\frac{dy}{dx} + \frac{2x}{1+x^2}y = \frac{\cos x}{1+x^2}$$

i.e. $\frac{dy}{dx} + Py = Q$

$$\therefore P = \frac{2x}{1+x^2}, \quad Q = \frac{\cos x}{1+x^2}$$

$$\text{I.F.} = e^{\int P dx}$$

$$= e^{\int \frac{2x}{1+x^2} dx} = e^{\log(1+x^2)} = 1+x^2$$

\therefore The required solution is

$$y(\text{I.F.}) = \int Q(\text{I.F.}) dx + c$$

$$\therefore y(1+x^2) = \int \frac{\cos x}{1+x^2} \times (1+x^2) dx + c$$

$$\therefore y(1+x^2) = \int \cos x dx + c$$

$$\therefore y(1+x^2) = \sin x + c$$

Exercise:

1) Solve $x(x-1) \frac{dy}{dx} - (x-2) y = x^3 (2x-1)$

2) Solve $(1+y^2) dx + (x - e^{-\tan^{-1}y}) dy = 0$

3) $\sin x \frac{dy}{dx} + y \cos x = x \sin x$

4) $(x^2 + 1) \frac{dy}{dx} + 2xy = 4x^2$

Thank You