

## **Research Projects at Remote Sensing Centre: Successful Examples of Interdisciplinary Research**

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**المشاريع البحثية في مركز التحسس النائي: مثال ناجح للبحوث البينية**

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### **الملخص**

التطورات الأخيرة جعلت من الحدود العلمية بين الاختصاصات تخترق مما جعلت بتحول البحوث من متجانسة ومختصة الى أكثر تعقيدا ومتنوعة وبينية. من الواضح بان بحوث وجهة النظر الواحدة تكون ذات محدودية المساحة التي يتم استكشافها او بحثها وبالتالي الابداع والاصالة تكون محددة. في المقابل التكامل بالنظريات من اختصاصات متعددة او كما يطلق عليها البحوث البينية ممكن ان توفر حلول خارج نطاق الاختصاص الواحد ونتيجة لذلك فان البحوث البينية ممكن ان تعرف بانها تكامل التقنيات والأدوات من وجهات نظر واساسيات متأتية من فريق عمل ذو اختصاصات متعددة يتشاركون معلوماتهم المعرفية لإنجاز بحث بصورة عامة بمساحة أوسع لحل مشكلة معقدة بما يكفي لتحل من اختصاص او وجهة نظر وحيدة.

ولأهمية البحوث البيئية فان مركز التحسس النائي في جامعة الكوفة قام بأجراء مجموعة من المشاريع البحثي في مواضيع مختلفة. وحاليا هناك أحد عشر مشروع بحثي قيد العمل بنسب انجاز مختلفة. النتائج الأولية لهذه المشاريع تظهر مخرجات واعدة. على سبيل المثال فان مشروع "الدراسة الجيواثرارية لاكتشاف مجرى القديم لنهر الفرات في محافظة كربلاء والنجف" من الممكن ان تكشف الموقع الحقيقي للمدن القديمة وبالتالي يمكن ان يدعم او يدحض الوصف الموجود بالكتب التاريخية. في هذا البحث سوف يتم مناقشة اشتراك اختصاصات متعددة في هذه المشاريع لإظهار كيف انها الطريقة الأمثل لحل المشاكل وإلنجاز البحوث.

**الكلمات المفتاحية:** البيئية، متعدد الاختصاصات، البحوث البيئية، مركز التحسس النائي، المشاريع البحثية.

## 1 Abstract:

The recent developments have made the scientific boundaries are breached that is led to transform research from homogeneous and disciplinary to more complicated, heterogeneous and interdisciplinary. Obviously, a single perspective research has limitations in area, which can be investigated or researched; consequently, novelty and creation might be restricted. In contrast, integration of theories from multi disciplines or what is called interdisciplinary may offer solutions are beyond the scope of a single discipline or area of research practice. Therefore, interdisciplinary research can be defined as integrated techniques and tools from different perspectives and concepts is made by different specialization teams sharing their knowledge to conduct investigation, commonly in wider area of research, to solve problem complicated enough to be implemented by only a single disciplinary perspective.

Acknowledging interdisciplinary, Remote Sensing Centre at the University of Kufa/Iraq has conducted some research projects in different area. There are eleven ongoing projects with various progress. The primarily result of these projects show promising outcomes. For instance, the project "Geo- archaeological study to discover the course of the ancient Euphrates River within the provinces of Najaf and Karbala" may reveal the actual locations of old cities, which might support or refute the historical books describing these cities.

In this paper, the involvements of different specializations in these projects are discussed to show how it is effective way to sorting problems out and conducting research.

## 2 Introduction

A single disciplinary perspective often has limitations because it is led by criterion and scope of a specific discipline without consideration and incorporation of alternative views. In addition, the single disciplinary perspectives may lead to dominance that suppress complex assessment of both their own and other perspectives. On the other hand, interdisciplinary based on multiple disciplines to possess a deep and thorough understanding of crucial issues and challenges researchers to integrate what each of the disciplines offers before attempting to answer satisfactorily questions (Szostak 2015).

Szostak (2015) defined the Interdisciplinary research (IDR) as a type of research by teams or researchers which incorporates information, data, techniques, tools, perspectives, concepts, and/or theories from multiple disciplines to improve fundamental understanding or to sort out problems whose solutions are beyond the scope of a single discipline or area of research practice, this may come in the form of a new understanding, new product, or new meaning.

Wilson (1998) contend that interdisciplinary, or what called it consilience, "jumping together of knowledge across disciplines to create a common groundwork of explanation is the most promising path to scientific advancement, intellectual adventure, and human awareness." He and interdisciplinary advocates believed that the crossing of disciplines boundaries will contribute in other breakthroughs crucial area (Rhoten 2004).

Rhoten (2004) believes that not all disciplines can accept interdisciplinary and gives an example that it is popular to see the mechanical engineer, atmospheric physicist, and public policy analyst as co-investigators on an interdisciplinary project. However, it is seldom to hear the hydrologist, economist, ecologist, and decision manager collaborating directly with one another in the field to sort out a problem in multi-objective model.

According to Rhoten (2004), some analysts contend that academic science has already welcomed the concept of interdisciplinary and the transformation is well underway from conventional way of conducting research—homogeneous, disciplinary, and hierarchical—to a new approach that is heterogeneous, interdisciplinary, horizontal, and fluid.

Laware, Davis et al. (2005) believe that interdisciplinary collaborations have become a way of life and are thriving, leaving behind the isolated disciplinary silos which have characterized many universities in the past.

This article is organized as follows: Firstly, the keys factors of interdisciplinary are discussed in the section three, then after, successful approaches to interdisciplinary projects are discussed in section four, followed by section five which presenting research projects of Remote Sensing Centre at the University of Kufa as examples of interdisciplinary research, ending up by recommendations and conclusions in section six.

### **3 Key Factors of Interdisciplinary**

By adapting “triangle of change” (Rhoten 2004) (shown in Figure 1), there are three key factors affecting interdisciplinary:

#### **Extrinsic attention**

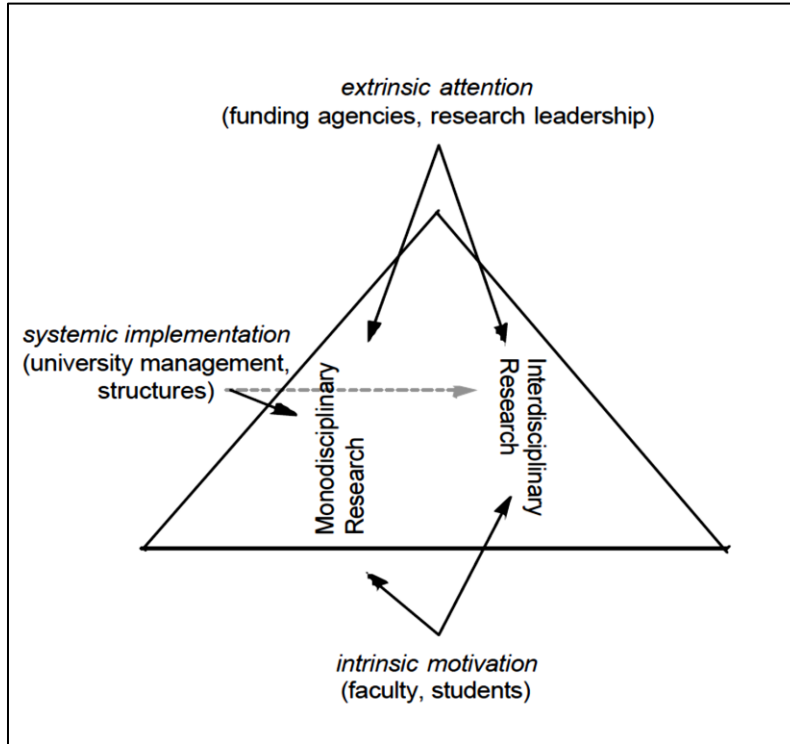
This means all support and fund which can be received for interdisciplinarity projects such as resources of government agencies, policy makers, scholarly associations, and university administrators.

#### **Intrinsic motivation**

Enthusiasm of universities and departments to establish multi-specialization programmes. In addition, motivation of students to apply for such programmes is a vital which may be a chainage for them in future career.

#### **Systemic implementation**

The universities, government and private organizations should reform themselves to meet the challenges presented by interdisciplinary research. For instance, they should install suitable labs for interdisciplinarity researchers. In addition, allocate enough vacancies for interdisciplinary education when seeking for employee.



**Figure 1 Key factors of Interdisciplinary according to triangle of change (Rhoten 2004).**

According to Rhoten (2004), the transition to interdisciplinarity and integration does not suffer from a lack of extrinsic attention or intrinsic motivation but, rather, from a lack of systemic implementation. In fact, many universities have head for approach interdisciplinarity as a fashion rather than a real transition. In other words, they are simply adopting the interdisciplinary labels without adapting their disciplinary outcomes. Therefore, they undertake their interdisciplinary efforts gradually and incoherent, rather than approaching them as comprehensive, root-and-branch reforms. This led to two levels of a problem: Firstly, the persistence of old structures created real or perceived disincentives to and penalties for pursuing interdisciplinary work; secondly, the lack of systemic implementation comes from re-name old structures rather than re-design these structures, generated initiatives that are incapable of achieving the goals they seek to fulfil. As a result, goals toward interdisciplinarity have been accomplished far less than they should, deem the ample monies devoted and the ample energies of scientists (ibid).

Finally, Rhoten (2004) summarised the failures factors of interdisciplinary research to be appealing for the academy as:

- The lack of funding of such research;
- The lack of interest of scientists to working across established boundaries;
- Incompatibility of university bonus and award structures with interdisciplinary practices.

#### **4 Successful Approaches to Interdisciplinary Projects**

Since there are multiple disciplines involved in the project, a detailed plan must be set up to show the steps required to produce a viable outcome. The unique perspectives of different disciplines should be reflected in this plan as objectives, methods, and techniques that can be used within the project. In addition, through this plan, the participants should understand why the project exists, for whom, who is doing what with whom, when the activities will occur, and how the plans activities are linked.

Furthermore, participants have to be willing to work harmoniously to achieve the plan objectives (Laware, Davis et al. 2005).

Laware, Davis et al. (2005) have given some advice for successful interdisciplinary projects:

**Ensure all right participants have brought into the project.**

All participants should feel ownership for the collaborative project, and they should agree rules, goals, and schedule. In addition, each member should know the value of his own contribution (Laware, Davis et al. 2005).

**Make sure the collaborative potential des not conflict with institutional perspectives.**

Since researchers need to divide their efforts between interdisciplinary projects and traditional disciplinary departments, they should know how to accommodate institutionally and professionally. If the disciplinary departments welcome the collaborative approach of research, it may lead to more successful project outcomes (ibid).

**The collaborative effort should be remarkable for its benefits to students, participants, and the community**

Typically, scientific promotion for the majority of universities is based on publications. However, interdisciplinary research, that needs time and effort, might decrease the ability of publication for the participants. Therefore, the universities should appreciate these initiatives by crediting those who participate in these cooperative exchanges because their outcomes might benefit the university, the faculty groups, and the community (ibid).

**5 Research Projects of Remote Sensing Centre at University of Kufa**

The Remote Sensing Centre is a consultative research facility affiliated to the University of Kufa. It undertakes scientific research, studies and expertise in the application of Geomatics Techniques to Governmental decision-making institutions as well as the researchers and postgraduate and primary students at the University of Kufa and other Universities in Iraq.

The Centre also seeks to establish the basis of scientific research by creating a convergence point between different disciplines interested in the application of Geomatics Techniques, and preparing an integrated system of plans, programs and research projects and leading the development of an effective partnership with government decision makers and the public and private sectors in order to achieve the purpose for which it was founded Centre, which is to contribute to the development and service of society and to find remedies and solutions to its problems.

The Centre's plans to study the problems faced by the community and find effective solutions to them in the form of multidisciplinary research. There are 11 ongoing projects (Table 1), each formed by university orders. One of the most important features of these research teams is that each member is willing to learn more about the “other”, open mind for employing concepts used by other disciplines, and accept the reduction of one’s owns concepts by others.

**Table 1 Research Projects at The Remote Sensing Centre.**

No	Topic	Team leader
1	Desertification treatment using a locally produced polymer material with a locally developed desert plant	Dr. Nihad H. Mutlak
2	The study of valleys in the west of Najaf and the possibility of establishing dams on these valleys, to ward up of the dangers of flooding and harvesting waters	Dr. Abdulkadhim J. Alabidi
3	Assessment of the seismic risk of Najaf city using remote sensing techniques and GIS	Dr. Hussain M. Hussain Al-Shimmary
4	Preparing a Database of Archaeological and Tourist sites in Najaf Governorate using GIS Techniques	Dr. Nabeel A. Rahi

5	Assessment of the environmental situation of Najaf Governorate	Dr. Abdulkadhim J. Alabidi
6	The possibility of using UAV	Dr. Hasan A. Jaafar
7	Study of the phenomenon of smoke in the Alruhban area, Najaf Governorate	Dr. Abdulkadhim J. Alabidi
8	Iraq's Geographical Gate of the University of Kufa	Dr. Hussain M. Hussain Al-Shimmery
9	National Life Water Project	Dr. Hussain M. Hussain Al-Shimmery
10	An archaeogeologic al study to uncover the course of the ancient Euphrates River between Najaf and Karbala Governorates	Dr. Abdulkadhim J. Alabidi
11	Study of the environmental sensitivity of desertification	Dr. Hussain M. Hussain Al-Shimmery

### 5.1 Specialisation of Participants

Acknowledging interdisciplinary, participants of all projects comes from different disciplines. In fact, projects are led by who specialised in main topic of projects, with considering to the higher scientific degree in the same specialisation. In general, there are 11 different disciplines (Figure 2 and Table 2) divided into six scientific degrees (

Table 3 and Figure 3). In total, there are 37 members in all projects (Table 4). Obviously, managing of these projects is not easy task. In addition, owing to many members are involved in more than one projects, hence, dividing effort between projects with teaching duties for many members is a vital task. The primarily result of these projects show promising outcomes. Unfortunately, we are not authorised to reveal outcomes of these projects in this research because they are still in initial stages.

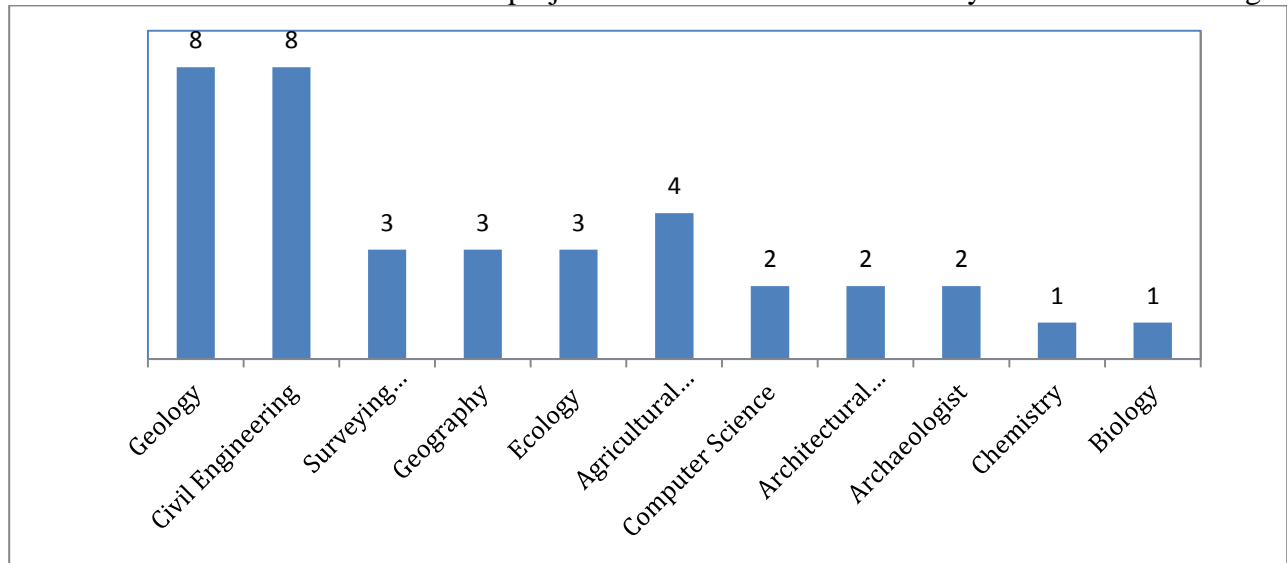


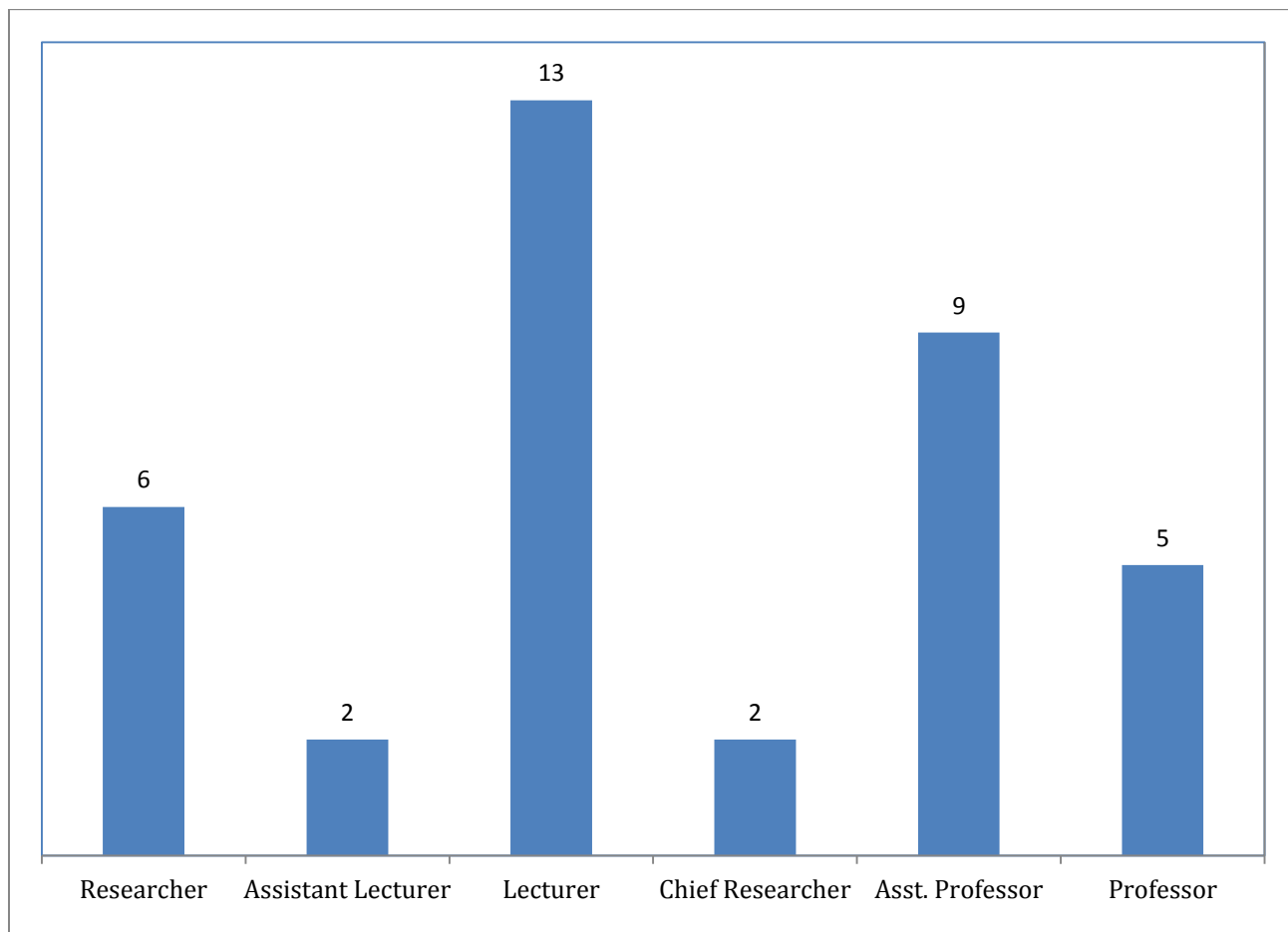
Figure 2 Number of participants according to disciplines.

**Table 2 Number of participants according to specialization.**

Specialization	NO
Hydrologist	3
Agricultural Engineering	2
Archaeologist	2
Chemistry	2
Environmental Geochemistry	2
Environmental Science	2
Geography / GIS	2
Geophysical	2
Geotechnical engineering	2
IT	2
Pedology	2
Surveying Engineering	2
Urban Planning	2
Applications of Geomatics	1
Architectural Engineering	1
Biologist	1
Construction Engineering	1
Engineering Geology	1
Environmental Geology	1
Geochemistry	1
Structure Geology	1
Soil & Water remote sensing	1
Structural Engineering	1

**Table 3 Number of participants according to scientific degree**

Scientific Degree	No
Professor	5
Asst. Professor	9
Chief Researcher	2
Lecturer	13
Assistant Lecturer	2
Researcher	6
Total	37



**Figure 3 Number of participants according to Scientific Degree.**

**Table 4 List of all participants in Remote Sensing projects.**

No.	Name	Specialization	Scientific Degree
1	Dr. Abdulkadhim Jaithom Al-Abidi	Geotectonic	Professor
2	Dr. Ayad Mohammed Al-Quraishi	Soil & Water remote sensing	Professor
3	Dr. Abdulzahra A. Al-Hello	Environmental Pollution	Professor
4	Dr. Amer Atyah	Engineering Geology	Professor
5	Dr. Ather Al-Hadad	Chemistry	Professor
6	Dr. Hussain M. Hussain	Environmental and Hydrologic/GIS	Asst. Professor
7	Dr. Hasan A. Jaafar	Geomatics Engineering	Asst. Professor
8	Dr. Ammar Jasim	Geophysics	Asst. Professor
9	Dr. Ali Naji Diebil	Structural Engineering	Asst. Professor
10	Dr. Aiad Abdullah Khlaf	Pedology	Asst. Professor



11	Dr. Laith Jawad	Construction Engineering	Asst. Professor
12	Dr. Nihad H. Mutlak	Agricultural Engineering	Asst. Professor
13	Dr. Kareem M. Bahya	Agricultural Engineering	Asst. Professor
14	Dr. Mustafa Abed Al-Jaleel	Surveying engineering/urban and regional planning	Asst. Professor
15	Dr. Maitham Abdullah Sultan	Environmental Geochemistry	Chief Researcher
16	Dr. Ali Abdulredah Ajeel	Environmental Geology	Researcher
17	Dr. Nasser Abdul-Razzak Al-Basri	Surveying engineering/urban and regional planning	Lecturer
18	Dr. Amjed Shehab Al-Jaafary	Geochemistry of Rocks and Minerals.	Lecturer
19	Mr. Sohaib Kareem Al-Mamoori	Geotechnical engineering	Lecturer
20	Dr. Ahmed Abbas Hassan	Structural Geology	Lecturer
21	Dr. Nabeel A. Rahi	Archaeologist	Lecturer
22	Dr. Ahmed Yhya Fyada	Geography/GIS	Lecturer
23	Dr. Abdulameer Sulaiman Dawood	Pedology	Lecturer
24	Dr. Ahmed Y. Abbas	Geography	Lecturer
25	Dr. Hussain T. Ateia	Geomatics Engineering	Lecturer
26	Miss Zainab Dekan Abbas	Civil Engineer	Lecturer
27	Dr. Qusay Mehsen Jauad	Hydrologist	Lecturer
28	Dr. Fadil Abed Al-Abbas	Hydrologist	Lecturer
29	Dr. Alla Hassan Jasem	Archaeologist	Lecturer
30	Mr. Jaafar Badr Al-Gburi	Environmental Science	Assistant Lecturer
31	Ms. Laheab Abbas Jasem	Geotechnical engineering	Asst. Lecturer
32	Mr. Mudher Hassan Abed	Environmental Science	Researcher
33	Mr. Mohammed J. Kadhem	Urban Planning	Researcher
34	Mr. Zuheer Jaber Hussain	Geophysical	Researcher
35	Mr. Mohammed Adel	IT	Researcher
36	Mr. Mohammed Saueed abed	IT	Researcher
37	Miss Worud Hassan Hade	Biologist	Researcher

## 6 Recommendations and Conclusions

- 1- The interdisciplinary centres need to be well funded.
- 2- The interdisciplinary centres should be located and directed independently from traditional university departments.
- 3- Researchers of the interdisciplinary centres should be nominated as flexible, intermittent but intensive short-term stays rather than administrative mandates. However, this does not apply on the leadership of centres.
- 4- Unfortunately, the outcomes of the cooperative research are under-appreciated and rewarded in the current academic structure as the scientific promotion is normally based on production of new knowledge in specific discipline.

- 5- The interdisciplinary centres should be populated with high skill individuals who can help and support researchers from different discipline. In turn, these centres should train such individuals.
- 6- Re-design graduate programs to meet the new form of research. They should educate students the broader problem-solving skills across disciplines rather than give knowledge and educate future scientists to be experts in chosen disciplines.

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