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NEW CHALLENGES IN CONNECTING SPACE PEOPLE ACROSS SCIENCE, EXPERTISE AND ACTION: CASE STUDIES IN EDUCATION AND OUTREACH

Jean-Daniel Dessimoz, Prof., Dr Sc., MBA,

Western Switzerland University of Applied Sciences (HESSO.HEIG-VD)
and Swiss Space Association (SSA/SRV)
CH-1400 Yverdon-les-Bains, Switzerland,
Jean-Daniel.Dessimoz@heig-vd.ch

ABSTRACT

Space exploration requires considerable means and concerns equally, in terms of vicinity, the whole population of the planet Earth. Although the segmentation of society has always been important, today's interconnected world requires a new perspective on society. Remarkably, the International Astronautical Federation (IAF) contributes to promoting excellence in matters relating to astronautics and space for all facets of society. Its main approach is to provide a forum for exchange and, more generally, to connect all people concerned by space ("space people"). However, this situation is changing as society tends to become more fragmented. In particular, science and action face the pressures of lean management, specialization, and efficiency considerations. Thus, traditional solutions need be reassessed. Among possible solutions, expertise, multidimensionality and breadth of view are increasingly significant. Moreover, the following changes are particularly significant: the appearance of flat structures and holonic networks due to increased productivity and communication; the development of hyperlinks and pervasive search techniques (ex, Google); a decreased team-coordination time due to novel tools allowing for immediate and ubiquitous information exchanges (Facebook, Twitter, YouTube, and daily news on the internet); and an increased interest in systemic approaches. These changes have led to an interest in developing a global role for IAF and similar bodies at lower geographical levels, and have highlighted an increasing necessity for funding, particularly governmental support, beyond tax-deductible donations.

1. INTRODUCTION

Space is a new territory for mankind to explore, beyond the planet Earth. Such a task is extraordinary in several respects. First, space is only 100 km away from each of us, and thus concerns all humans in a very similar way. Furthermore, astronautics require substantial resources that include the contributions of many individuals and the use of multiple disciplines. In this unprecedentedly large context, effectively and efficiently connecting people and defining shared sub-goals are in themselves critical tasks.

Half a century of historical achievements have shown that exploring space is possible. These achievements include landing on the Moon, watching the far universe through the Hubble facility, or regularly synchronizing at world level in the framework of the International Astronautical Federation, IAF [1, 2].

Nevertheless, as changes occur, we must reassess past paradigms, identify new challenges, and create appropriate new approaches.

This paper discusses new challenges for connecting space people. These challenges stem

from the segmented nature of traditional approaches that fail to address the pressures of lean management, specialization, and efficiency considerations that science and action face today. In terms of solutions, expertise, multidimensionality and breadth of views are increasingly significant.

Section 2 presents an overview of the challenges to be addressed. Section 3 describes the traditional segmentation of society. Section 4 presents various traditional solutions, and Section 5 addresses novel, more recent solutions. Finally, Education and Outreach (EO) provides a case study to illustrate the discussion.

2 CHALLENGES FOR SPACE AND ASTRONAUTICS

The following section provides an overview of the situation by describing the scope and relevance of astronautics today, and then outlining the challenges it faces.

2.1 Astronautics and Space

Hardly 50 years have passed since humans first “reached” space with the satellite, “Sputnik.” At first, the general public, at least in the northern hemisphere, were very curious about humans landing on the Moon. This concern was due to the tense environment of the Cold War, and to the relatively recent memory of World War Two, which had caused so many traumas. It was obvious that space travel could be a major threat. Then, for many years, astronautics and space seemed to lose its luster in the public’s attention.

Nowadays, a strong revival in this interest can be observed. Humans are electronically connected by dense and rapid networks, which depend on satellites to reach remote areas. GPS has become ubiquitous, and many people now rely heavily on satellite signals to orient themselves when they travel by car. Science has made major advances thanks to numerous missions through the solar system. An inhabited relay is permanently available in space, with non-interrupted stays of hundreds of astronauts and up to 13 at one time. Robots have been active on planet Mars and elsewhere in operations that sometimes last longer than a year!

2.2 Traditional Challenges

The challenges set by space and astronautics are presented here under three important categories: the necessity of global promotion, the segmented nature of society, and the requirement to establish possibilities for wide-ranging interconnections.

2.2.1 Global Promotion

Space exploration and astronautics require substantial financial means. A clear example is the multinational support necessary for the International Space Station. Even when attention is focused within national boundaries, it is evident that extensive governmental support is necessary. Finally, in democratic states the population must clearly support a positive governmental decision.

Therefore, the astronautic community faces the serious challenge of informing the general public of today’s space exploration, and incorporating their expectations and wishes into the most relevant sub-goals.

2.2.2 Segmented Society

Classical approaches to structure systems, which organize subsystems into trees, matrices, and networks of networks, present a serious challenge to

us today. By this token, specific communication channels are typically made available for different groups in society including the young, the old, women, military forces, research, business, and administration. This point will be developed in §3.

2.2.3 Appropriate interconnection means

In ancient times, a central square (forum) was enough to connect the people of a community. Then, communication was restricted to an elite group of citizens in a town that would look very small in comparison with today’s vast urban centers.

Today, the change is extreme. The two points mentioned above highlight two challenging factors in developing means of interconnection: the breadth of the population, and the segmentation of society.

3 SEGMENTED SOCIETY

Today’s enormous global population prevents researchers from keeping track of individual interests and particularities. On the other hand, lumping all individuals into a single group, such as society or mankind, also prevents these differences from being retained. Therefore an intermediary approach, which involves multidimensional sub-regions, is worth adopting. For this context, science and action are the main dimensions addressed; then, other dimensions are also discussed.

3.1 Main Dimensions

Space and astronautics, like other social domains, can typically be divided into two major dimensions: science (research and learning) and action (economy). The discussion will follow this categorization in two consecutive paragraphs. However, in practice, a certain balance is always necessary between the two, and depending on more specific optima, new opportunities arise.

3.1.1 Science

In nature, humans have a unique ability to understand the world, and on this basis to create useful models. Academic research is on the frontline of scientific progress, and current Nobel prizes promote progress by rewarding excellence in this dimension. Universities and schools are crucial in the task of educating all people and exposing them to science.

3.1.2 Action

Action changes the world. Today, the largest segment of the world’s population is involved in the

production of goods and services. This situation raises important issues, particularly process control, material transformation, and communication. Typically, enterprises and businesses develop in these fields, and excellence is proven by large market shares and economic success.

3.1.3 Balanced approach

In reality, no resource can be strictly confined to a single group. In the past, large companies not only used to build up production facilities (action), but also to organize their development and even fundamental research (science). IBM and Novartis are still excellent examples of this culture, yet the pressure to restrict institutions to their core roles has become stronger. Thus new solutions are required to cover mixed domains such as innovation, elaboration of rules and standards, applied research, knowledge, and technology transfer (Fig. 1).

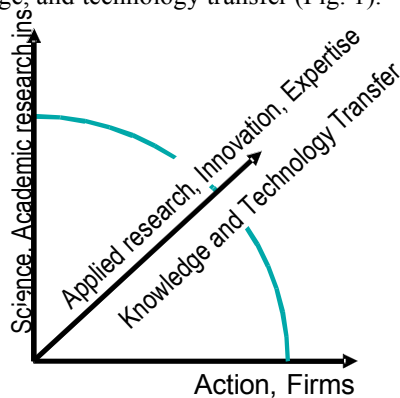


Fig.1 When science and action focus on their respective core roles (axes), new needs appear in mixed areas: in particular, innovation, development of regulations and standards, applied research, knowledge, and technology transfer. Excellence is similarly required in all fields (green circular boundary).

3.2 Other Dimensions

Although they are of lesser importance than science and action, many other dimensions are also worth considering to better understand the current fragmentation of society. These dimensions include time, social granularity, secrecy and many others yet.

3.2.1 Time

Time is an important parameter for segmenting society: for example, age is critical for distinguishing children from young adults or retirees. Some groups have a strong interest in the

past, in history, while others may be more concerned with prospective visions and the future in general.

3.2.2 Social Composition and Granularity

The degree of aggregation of people is the primary dimension structuring political subspace, from individual-centered perspectives (right-wing) to collective-oriented perspectives (left-wing). More generally, private, associative, or governmental characters are significant values along this axis.

3.2.3 Secrecy

The degree of secrecy surrounding information is another important dimension for this context. Some items are in the public domain while others are more or less confidential. Degrees of secrecy range from nil or mild constraints (ex. "copyleft" licensing) to sophisticated protection schemes and top-secret status.

3.2.4 Extreme Segmentation

The International Astronautical Federation's development of its structures reveals significant dimensions of society, and gives insight into why society is so segmented. These dimensions include independent technical axes such as astrophysics, propulsion, communications, security, education and outreach, and many more. Other, seemingly "more orthogonal," dimensions are the Hall of Fame and awards, and legal aspects.

4. TRADITIONAL ELEMENTS OF SOLUTIONS

To meet the discussed challenges of reaching a large audience and coping with the segmentation of society, various traditional solutions are possible. Below, the resources and organizational modes necessary to meet these challenges are briefly presented. This discussion will begin with organizational aspects.

4.1 Organizational Modes

Here, the goals are to efficiently integrate individual contributions, and to join forces while avoiding duplications. Classical methods rely on hierarchies, standards, market law, forums, and networking.

4.1.1 Organizing Hierarchies

Hierarchies (i.e. pyramidal or tree-like structures) are an efficient paradigm to interconnect individuals with a small number of direct links. The number of communication links increase logarithmically with the number of elements.

This approach is, of course, present in various ways in IAF's work. For example;

- Members, including agencies, national societies, and consortia
- Technical and administrative committees
- Congress and symposia

4.1.2 Developing Standards

The development of standards is another favorable approach for connecting people and systems. Traditionally, this approach was the essence of culture and developed across the world at a local level. Moreover, this local development took a long time. Today, the heterogeneity of culture is such that new standards are required at a world level. A powerful way to establish a global common culture is provided by movies, news channels, and popular media such as soap operas and cartoons.

4.1.3 Fostering Exchanges of Commercial Off-The-Shelf Components COTS

The market mechanism is recognized as the major paradigm that efficiently balances supply and demand. It is most effective in the case of commodities. For the time being however, space exploration does not involve many commodities or real markets. Goods and services are scarce or even unique for the largest astronautic entities (ex, ISS and the Hubble telescope). Nevertheless, as time passes, it is expected that the market will become an applicable paradigm to astronautics.

4.1.4 Providing Forums and Developing Networks

Interestingly, when people meet, the number of possible communication channels increase much faster than the the number of participants (square law). With such a wealth of possibilities, no particular strategy is required from participants, and their communication is naturally synchronized.

Forums are obviously a good strategy to connect people because they provide a common location for communication. Moreover, a significant advantage stems from the fact that, necessarily, participants will be synchronized both in terms of availability and their common focus of attention.

Over the past two decades, the Internet has drastically improved the infrastructure of networking, making it possible for people to connect across almost limitless physical distances. However, the second feature of forums – synchronicity, or the immediate ability to react – is not so easily replicated.

4.2 Special Resources

The primary financial support for developing space activities is provided by specific governmental funds and economic actors. Additional means are necessary though, and they are provided by a variety of other channels and sources: synergies, volunteers and sponsors, associations, and non-governmental organizations (NGOs).

4.2.1 Synergies

Space is often a domain of interest for actors and institutions not specifically established for that purpose. With the use of appropriate synergies, much can be gained for space and astronautics, especially when partners are comparatively large. Possible partners include public education, research and development, astronomy, aerospace, and mass media.

4.2.2. Volunteers and Sponsors

In today's world, and especially in developed countries, citizens have the time, knowledge, and desire to contribute freely to projects they find appropriate. The typical advantages of these contributors include enthusiasm, expertise gained in other useful areas, and flexibility. Similarly, sponsorship may result from a similar attitude. Companies may aim at improving their public image by contributing to science, or sometimes rationally aim to profit from the possibility of reaching a specific segment of society for their own business.

4.2.3 Associations and Non-profit Organizations

As volunteers and sponsors become more numerous, they tend to be better structured. They may develop into associations and NGOs so long as established institutions do not already exist. The IAF and learned societies that contributed to its inception are typical examples of this process.

5. NEW ASPECTS

The world continues to change, and recent years have brought notable developments affecting the ways people may connect with one another. The following section reviews some of these developments, along with strategies to adapt to the new situation. The discussion will cover flat

structures, hyperlinks, new tools on the Internet, the focus on core properties, and holistic approaches.

5.1 Flat structures, Holonic networks

It is increasingly possible to use alternative network structures to trees and hierarchies. Structures can be kept “flat” so that they are easily reconfigured, and holonic networks can be broken up and survive as separate subnets. These new structures are very significant trends. Today, individuals are directly and rapidly accessible, even within large networks, thanks to cellular phones and ubiquitous Internet.

5.2 Hyperlinks and Google search

Until a few decades ago, content-addressing was considered a mechanism typical of the human brain (ex, associative memory), yet nowadays this paradigm has become a common practice in the digital world. Hyperlinks and Google searches do not require any classification, unlike traditional information searches that are still practiced in physical facilities today (ex, bookstores, libraries) where items are sorted according to theme, chronology, or number.

5.3 New tools on the Internet: Facebook, Twitter, YouTube, Daily News

On the Internet, novel tools connect people in an event-driven, multimodal way that combines text, images, sound, and videos (ex, Facebook, Twitter, YouTube, daily news). These tools in turn allow for collaborative information-sharing on a large scale. The potential for information-sharing exists for all domains of interest; the tennis player Roger Federer for example, now has 2.5 million “friends” staring at his Facebook “wall.” As will be discussed below, these tools may also be useful for space-related topics.

5.4 The Focus on Core Properties

As mentioned above, there is a strong tendency to restrict institutions to their core missions - namely, science or action - in terms of societal dimensions (§3.1). However, this restriction risks widening social gaps and even tearing social material apart.

At the same time, such threats do not pass unnoticed and contrasting trends develop.

5.5 Increased Awareness of Holistic Needs

Today there is an increasing awareness of the need for a holistic, rather than analytical, view of systems

and ultimately our world. Systemic approaches are more suitable for reaching overall balance and devising new measures complementary to activities in specialized domains.

For astronautics, IAF is in a good position to undertake such a role of global monitoring and strategy-definition at a world level. This role should develop, and agreements are underway with the United Nations (UNO) to define the tasks that should be achieved.

At the same time, however, the need for funding for the planned activities will similarly increase. For such a global approach, funding should be provided by governmental sources.

This challenge is similar at lower geographical levels, particularly for national IAF member societies.

As of today, government structures seldom permit the kind of financing that is required by IAF and its member societies because national budgets are traditionally split in very intricate accounting systems. Some complementary measures for governmental support in generic domains may in some cases be provided, ex, by tax-deductible donations, but they are not yet sufficiently developed.

6. SPACE EDUCATION AND OUTREACH

The following section discusses case studies in the context of space education and outreach (SEO). They illustrate the points made above: the balance between science and action for IAF (positioning); the balance between specialization and the systemic approach of SEO Committee (scope); the increase of resources with a solid framework for volunteers through the support of CNES; the use of novel internet-based tools and techniques for SEO; and the necessity to gather diverse resources to connect people concerned by space across multiple segments of society (ex, Swiss Space Days).

6.1 IAF Positioning

IAF provides a good example of a balanced approach to expertise typically mixing science, action, honorary measures, and legal matters.

In its broad scope of activities including education, outreach, and workforce development, IAF deals with science topics typical for the Committee on Space Research (COSPAR) [3], and simultaneously

thousands of volunteers and reaching millions of children over the years.

Nevertheless, it is still typical of space matters that neither traditional governmental structures nor the free forces of commercial business have found an answer to the challenge of funding this initiative. Forcing existing structures to exclusively focus on their main missions leaves a void that is difficult to fill with volunteers. Over the years, in activities that unavoidably require financial support, a mix of good will haphazardly coalesce with support from various ministries (youth, sports, education, research, culture, and environment), institutions and large companies, as well as science museums and numerous local communities.



Fig.3 Information by IAF on Facebook (upper part) sometimes includes ESA information for students (lower part).

6.4 SEO on New Media

As discussed above, the Internet is providing novel means to connect people. Under the initiative of the IAF executive secretariat, in particular of Philippe Willekens and Scott Hatton, effective projects are being undertaken to promote awareness of space and astronautics.

A few years ago, IAF management has started supporting a database, and since then IAF website has grown in content and possibilities. Today, news updates are broadcast on a daily basis, and a nascent presence is visible on blogs, Facebook [6], YouTube, and Twitter [7].

Typically, new tools are combined to allow for easy navigation within and across media (ex, IAF), and links to further resources are provided. Figure 4 provides an example of various web-based resources addressing the youth and the broad public.

Currently, effective or promising advertising possibilities are considered the primary mechanism for funding the infrastructure and labor of these projects.

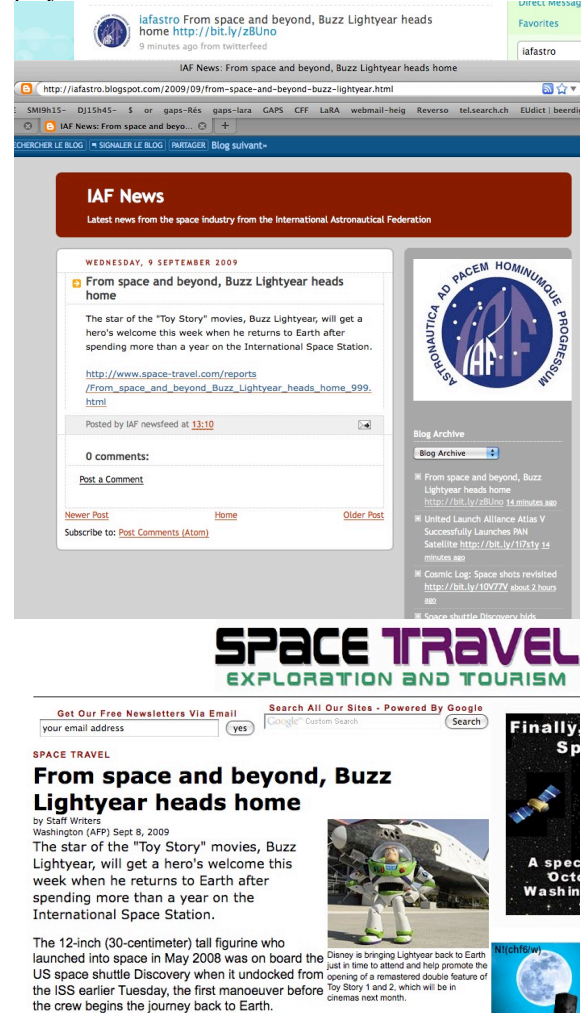


Fig.4 IAF information flows through various platforms, either “internally” i.e., with IAF references (in Twitter, upper, and Blogspot, middle), or with reference to other websites and social actors (lower). Here the topic connects a major space resource (ISS) to the general public via references to a popular movie character.

6.5 SSA Space Days and Other Actions

The cases discussed above have mostly addressed global or continental issues. For one case though, the point of view was reframed to national limits: France, which is a large and pioneering country.

Here, attention is focused at a smaller scale in a complementary effort to replicate this project in many other situations, in numerous countries. The following section will review the Space Days 2009 in Switzerland, organized by Swiss Space Association (SSA/SRV), and a series of more local events.



Fig.5 This year, space is the major cultural feature in the program of the largest trade fair in West Switzerland. The latter also hosts the “Space Days 2009” of the Swiss Space Association.

After Lucerne in 2007 and Zurich last year, the SSA committee and members selected Lausanne to host their two Space Days in 2009. Experts reported on the theme, “40 Years in Space; from the Moon Landings to Today’s Space Missions.” Synergies and cooperative efforts were initially sought with the National Cinematheque in Lausanne, and then a better opportunity developed in the form of a special event in cooperation with several independent initiatives. These partners were the annual exhibition days of “Le Comptoir Suisse,” a trade fair with strong cultural components; the International Year of Astronomy (IYA), a youth-oriented event by the Space Center of the Swiss Institute of Technology (EPFL) in Lausanne; and an exhibition prepared by the University of Bern. Support was also gained from local organizers (the City of Lausanne and Lake of Geneva Region), from industrial partners (Ruag, Montena and the Swiss Space Industry Group, SSIG), and, as in most other years, from ESA, and the Swiss Academy of Technical Sciences

(SATW) [8, 9]. These contributions were complemented by a support from the Ministry of Home Affairs (Secretariat for Education and Research; Swiss Space Office).



Fig.6 Another initiative, another mix of partners. Here, excellent leverage for reaching the youth is obtained by addressing specialized material of ESA to schools and teachers with the help of a University of Pedagogy and additional technology specialists.

As long as traditional structures prevail, such events cannot be organized by governmental services. Switzerland has strategically decided *not* to create its own space agency but rather to fully co-found and support the European Space Agency (ESA). In return, ESA provides support for selected items, notably material [ex, 10] and expert delegates. Nevertheless, many more resources are required, including a workforce and money for infrastructure and logistical costs (ex, the travel expenses of an American astronaut). Here, SSA’s own resources are

critical, in addition to the mentioned partners and sponsors who share concern for space education, public outreach, youth motivation, and future workforce renewal. For example, these partnerships allow for more than 8 pages of space material to be printed in a document of 100 pages to be distributed in quantities larger than the population of Lausanne (fig. 5)!

In another example (fig. 6), targeting school teachers potentially exposes more young people to space matters. The partners in this project include, like previously mentioned initiative, the Swiss Space Association, the Swiss Academy of Technical Sciences, and the ESA[11]. However, all of the additional partners are different. They include a sophisticated, unique multi beamer system (Planetarium Zurich, [12]), an association aiming to expose young people to technologies (IngCH), the City and Canton of Zurich, the Swiss Federal Institute of Technology in Zurich (ETHZ), a strategic development association (Entwicklung Schweiz), the unique institution Migros (the main distribution company in Switzerland, which freely devotes 1 percent of its financial *turnover* to social matters), schools, the University of Pedagogy of Lausanne, and Robot-CH, the Swiss association for the promotion of robotics.

7. IMPROVING SOLUTIONS

Having reviewed the challenges of connecting people concerned with space and astronautics, along with potential solutions, we can now sketch plans for improvement.

Three main principles are developed below: reliance on expertise as a complement to science and action; the allocation of public resources for selected integral needs; adaptation of solutions to specific geographic areas.

For all three principles, IAF will be a crucial component in implementing solutions.

7.1 Expertise and IAF

Progress has been made through the years, and the time has come to structure our organizations according to a more refined and complex model.

In addition to the specific domains of excellence in pure science and, respectively, pure action, an additional specific domain, expertise, must be better recognized. In expertise, a balanced approach of science and action is typical, and similar levels of excellence are reached.²

² In MCS cognition theory, « knowledge, K » is a property which essentially qualifies science, and

IAF has proven for half a century its excellence, stretching its membership base and activities from the limits of conceptual science to the boundary of the economic market. Focusing means here the pursuit of mixed approaches, and, when support leans towards one of two extremes, the optimal balance of these extremes through symmetric support for the under-supported.

7.2 Interdisciplinarity and IAF

Public administrations have generally developed according to hierarchies, progressively splitting resources into ministries, categories, and subcategories. Similarly, society is often seen in the segmented way discussed above.

IAF, on the contrary, addresses its domain of expertise, space and astronautics, in a holistic way; it addresses all aspects of the domain for the benefit of all segments of society.

A major challenge remains in matching the global benefits of astronautics with the appropriate public support. Part of public resources should be set aside for supporting and financing “intersegmentary” projects and activities.

7.3 Multi-scale Geographic Organization and IAF

Often, a geographic scheme for splitting large problems into smaller ones can be useful. Based on this principle, space matters should also be considered at the most local scale.

However, as discussed above, space is unique in the way it requires substantial resources and relates to all humans. Therefore, splitting may not be absolutely applicable, and care has to be taken to optimally keep, at each level, the larger perspective for relevant activities.

Internationally, IAF and the United Nations are particularly important. IAF is ideally situated to connect space people across the world, and the UN is a natural channel for supporting and complementing IAF in this global context.

However, smaller scales also make sense for some activities. It may be observed today that space activities are most successfully developed by agencies at sub-continental levels (ex, ESA) or, for large countries, at a national level (ex, NASA, CSA). IAF’s international approaches should likewise be developed at national levels by IAF members as often as local opportunities permit.

« fluency, f » (with unit inverse of time) essentially qualifies change or action ; their product defines « expertise » [12, 13].

The Swiss case is an inspiring example of what may develop at smaller scales in many other regions. Switzerland contributes, like all other states, to the United Nations, and it also contributes as a full member to ESA. Surprisingly though, at the national level, no governmental agency is organized in Switzerland for space matters. Nevertheless, significant resources are implicitly available within traditional governmental categories: education, research, economy, etc. In the mix of resources that come together for IAF member events and space topics (ex, SSA), a large component typically comes from very local partners and temporary partnerships. As a special measure, some modest public funding is also traditionally allocated to national academies (in IAF's case, the Swiss Academy of Technical Sciences - SATW) to finance selected projects and activities. This process should be encouraged for space and, more generally, for promotion in technical and engineering domains to counter the lack of an adequate workforce in these sectors.

8. CONCLUSION

Space began to be explored less than 50 years ago. Rapidly, space appeared as a new ground for which radically different approaches had to be devised.

The challenges are diverse. Everyone on Earth is similarly concerned by the immediate vicinity of space, and huge amounts of resources are required for new developments. Society is finely segmented, and providing a corresponding degree of education and outreach seems impossible.

Society is segmented across many dimensions; science and action schemes are well established, but they must be complemented by many ways. These strategies include mixed domains and domains primarily depending on time, social granularity, or other dimensions.

The traditional elements of solving such problems rely on traditional modes of organization and a variety of resources.

However, new aspects have appeared, such as the flattening of hierarchies, holonic structures, hyperlinks, and novel Internet tools. These innovations allow for new possibilities to interconnect people quickly and directly.

In the context of space education and outreach, five study cases concretely illustrate IAF's positioning and operations, as well as the same for some of its committees, tools, and member societies.

Improvements should be made in recognizing the unique positioning of IAF and its many public-oriented contributions, which should be matched by corresponding public financing. Complements should be brought to the traditional division of

administrative sectors to support, directly or indirectly, a certain ratio of "intersegmentary" and transversal activities, in particular for space matters. Space matters must be organized at all levels of the geographic scale. At the world level, more support is required, and the lower the level the more solutions must be tailored to local needs and singularities. Similarly, at the world level the General Assembly of the United Nations (via notably COPUOS) plays that role. For Switzerland and probably most Western countries, parliaments are the joints where public means converge and can be redistributed in an optimal and holistic manner. As the need for space-related development increases, will these governmental structures also support more IAF-type actions in favor of the general public?

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REFERENCES

- [1] "IAF. The First 50 Years »; Leslie R. Shepherd, The International Astronautical Federation, *Acta Astronautica*, **32**, 1994; and also the book with same title, IAF, Paris, 2001, 176pp.
- [2] International Astronautical Federation website, Comprehensive source of information about the international space-advocacy organization plus news and event information; www.iafastro.com, 8.7.2009
- [3] "*COSPAR, Committee on Space Research*", information brochure of COSPAR Headquarters, Paris, 8 p., 2002.
- [4] IAC 2009 Daejeon Sponsorship information, Daejeon Organizing Committee, EXPO Science Park Office Building, Yuseong-gu, Daejeon, pp. 17, 2009
- [5] Planète-Sciences website, 2009, <http://www.planete-sciences.org/national/quisommesnous-presentation.html>
- [6] Facebook link for International Astronautical Federation (IAF) ; a social utility that connects people with friends and others who work, study and live around them...www.facebook.com/group.php?gid=14240851223
- [7] IAF (Scott Hatton) (iafastro) link on Twitter, updates from the International Astronautical Federation. <http://twitter.com/iafastro>
- [8] SATW - Science and Technology for the Benefit of Society, Presentation, Swiss Academy of Technical Sciences, 6p. 2009
- [9] L'avenir de l'éducation et de l'industrie suisse, Congrès SATW, Palais des congrès, Bienne, 24-26 Sept.

2009

[10] Link to the presentation of a European show prepared by major European Planetaria, 2009, <http://www.planetariumshow.eu/>

[11] Link to the description of Space Events organized in Zurich, Sept. 2009, incl. Show of planets, for schools, http://www.esa.int/esaCP/SEMY65LW3ZF_Switzerland_fr_0.html

[12] Link to website Mobile Planetarium Zurich, http://www.esa.int/esaCP/SEMY65LW3ZF_Switzerland_fr_0.html

[12] “La Cognitique - Définitions et métrique pour les sciences cognitives et la cognition automatisée”, Jean-Daniel Dessimoz, ISBN 978-2-9700629-0-5, Aug. 08.

[13] Jean-Daniel Dessimoz, "Cognition Dynamics; Time and Change Aspects in Quantitative Cognitics", Second International Conference on Intelligent Robotics and Applications. Singapore, 16 - 18 Dec.09