Agriculture and food workers question nanotechnologies. The IUF resolution

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Abstract

Nanotechnologies are the next technological revolution. They are distinguished from all previous examples in that the production of new materials and the new functionalities given to already-known materials. This unique, near-alchemist character of these technologies allows them to be applied to almost any economic sector. This could have profoundly transformative effects upon old technologies and products, in some instances devastating, in others, liberating. The repercussions in the social and economic spheres in the coming years are expected to be equally pervasive.

In this article we analyze the resolution of the ***International Union of Food, Agricultural, Hotel, Restaurant, Catering, Tobacco and Allied Workers' Associations (IUF)***, on nanotechnologies; contextualizing them in the current debate on the social and economic implications of nanotechnology and its potential risks to health and the environment. The IUF resolution carries considerable political weight, considering its global scope, as it represents about 12 million workers from more than 120 countries. Its importance also lies in its origin, as the expression of class interests facing nanotechnologies.

The nanotechnology revolution

Nanotechnologies are the most important technological revolution of our times. The technical characteristic that distinguishes them is the production of new materials and the fact that known materials have been given new uses. This is feasible because nanotechnology manipulates material at the atomic, molecular and macromolecular level, which results in new properties for the material, different from those known in the size in which they appear in nature (RS & RAE, 2004). Carbon, in its known form as graphite, is soft and an electric conductor; as a diamond, also a natural form, it is the hardest substance and does not conduct electricity. However, fullerenes, created with nanotechnology, form fullerite crystals which, mixed with elements such as rubidium and potassium, are converted into superconductors. Furthermore, carbon nanotubes, also created using nanotechnology, are very hard, up to a hundred times more resistant than steel, and at the same time six times lighter and are electric conductors and superconductors (Terrones, 2005). At the same time that elements on the nanoscale provide us with new properties that can be used to our advantage, they may also generate new and unknown types of toxicity (Bartis & Landree, 2006). To this end, current regulations are in no way adequate or sufficient and new evaluations

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are required, a fact which is recognized by American and British experts (Food navigator.com, 2006; Carlstrom, 2005).

As a result of the new materials and properties that can be found in materials that are already known, it is possible to bring together in one single product functions that used to require number of products. Australia's TipTop bread, for instance, contains Omega 3 nanocapsules (www.tiptop.com.au). Therefore, in addition to its ordinary purpose as a foodstuff it is also a food supplement, something that used to be obtained through pills, olive oil, etc., which had to be packaged, commercialized and sold separately. Nanotech Inc., produces paint with different functions such as significantly increasing thermal insulation while acting as an anticorrosive and antifungicide (Barrañon, 2007). Again, several existing products are combined into one. Clothes that do not get wrinkled, are stain free and can maintain body temperature irrespective of external temperatures is another example of this same tendency to combine different functions into one product by way of nanotechnology.

In other cases, the new nanotechnology product replaces the old because it carries out the same function more efficiently. A sunscreen that can penetrate deeper into the skin and totally block ultraviolet rays could quickly substitute its predecessors (BusinessWeek, 2005). Packaging that issues a warning when the validity expires and which can prolong the life of its contents would do away with a great deal of supervision and maintenance work and the products currently used to carry out these functions.

In terms of capital accumulation, nanotechnologies may be considered as the equivalent of conquering a new world as the enabling character of these technologies means they can be applied to practically any production process with a resounding victory over old technologies and products. Given their disruptive characteristics, and the fact that they are arising in a highly globalized world market, it is foreseeable that the speed with which they reach the market on a worldwide scale and the scope of their diffusion will be larger than any previous technological revolution. It is clear that this will have deep hitting effects on the social division of labor. New industrial lines will appear and others will vanish. Vegetable textiles, iron, copper, coffee and tea, and many other natural products, could find themselves reduced as merchandise imported by developed countries and, as a result, whole sectors of the world economy as we know it today will be torn apart (ETC Group, 2005b).

Nanotechnologies will also have a deep impact on the working classes. On the one hand, this is because the multiplication of functions that will be a characteristic of nanotechnological products will significantly reduce the workforce required for the manufacturing process, handling, storage, transport and commercialization of older products which will be disappearing off the market. On the other hand, this will happen because it is likely that lower dependence on environmental contingencies and natural resources will mean a change in the geographic location of industries, consequently displacing the workforce and leading to labor migration.

Científica, a company that provides consultancy and information on nanotechnology, published a report early in 2007 (Científica, 2007), which concludes that there is an ongoing centralization process in companies that produce nanomaterials, reducing small firms and concentrating production in large multinational chemical corporations. At the same time, the report highlights that the production of nanoparticles will allow many lines of production to incorporate nanocomponents into their products, thus projecting a market for products with nanoparticles at 1.5 trillion (10^{12}) dollars for 2015. While this opens up many opportunities for the accumulation of capital, the outlook is not so good for the working classes and the underprivileged, who will bear the brunt of the impact of these changes in production.

The International Union of Food, Agricultural, Hotel, Restaurant, Catering, Tobacco and Allied Workers' Associations (IUF) is an international federation of trade unions of workers in agriculture and crops, the preparation and processing of food and drinks, hotels, restaurants and catering services, and all phases of the production and processing of tobacco. It is a huge federation with a long history, stretching back to 1920. Today its membership is made up of 336 unions from 120 countries, representing a total of twelve million workers (IUF, n/d).

The Latin American Regional Secretariat of this federation (Rel-UITA) met in October, 2006, in Santo Domingo, for its 13th regional conference. With the presence of thirty-nine workers' organizations from fourteen countries and ninety-five delegates a resolution was issued on nanotechnologies. In general terms, the declaration called for public debate, warning that products containing nanocomponents were being launched onto the market before civilian society and social movements had a chance to assess their possible implications in economic, environmental and social terms and their effect on human health. Furthermore, the declaration warned of the need to make sure that the debate of a matter that will lead to deep social changes should not be left to the "experts". This is possibly the first declaration issued at a continental level by a federation of trade unions. Months later, in March, 2007, the 25th Congress of the IUF was held in Geneva. Rel-UITA introduced the Santo Domingo resolution into the talks, and it was approved, thereby extending its impact to all 120 countries and over 12,000,000 workers. A resolution of this nature, clearly questioning the way nanotechnologies and their products are being introduced, certainly means that reflection on this issue is necessary.

1. The IUF Resolution

There are six points in the IUF resolution, which we will now analyze.

> **1. To mobilize our affiliated organizations and urge them to discuss with the rest of society and governments the possible consequences of NT**

In developed countries there is an attempt to bring public debate and participation into the development of nanotechnologies. Several countries have a great deal of experience in the mechanisms of the participation of the layman in the evaluation of technologies and decision making on science and technology (S&T). These mechanisms recognize the need to democratize decision making in S&T, going beyond the evaluation of "experts". The level of democratization varies depending on the concrete goals that are sought through public participation. When the aim is to detect potential negative implications of a given technology, which can range from risks to ethical dilemmas, this opens up the possibility for social intervention in the design and regulation of this technology. When the goal is to assess the reactions of consumers to new products, to provide guidance for companies to improve their image, democratization is restricted to the sphere of consuming. The level of democratization also depends on the design of methodologies of participation. Most are aimed at the "general" public and directly involve a small number of citizens. This leads to questioning whether society is effectively represented and its real power to influence decisions. Although a handful of citizens can gauge public perception of a technology, citizens, taken as individuals, have no political power to mobilize and negotiate in the way that civilian organizations and organized social movements do. Although social organizations defend the interests of specific sectors and groups and their position on a certain technology tends to lean towards their interests, this tendency should not be seen as an obstacle to democracy but rather as part of the rules of the democratic game.

The IUF resolution, issued by hundreds of unions, also follows this trend in that it analyzes the issue from the point of view of its workers in this debate. The IUF is not opposed to nanotechnologies in principle, nor does it discuss the technical potentials. What it calls into the question is the speed, consequences and social implications. The IUF declaration, besides its explicit content, plays an important social role: that of warning, not only its members, but also governments, industry and international organizations that this sector of society is alert when it comes to the development of nanotechnologies.

2. To demand that governments and the international organizations concerned apply the *Principle of Precaution*, prohibiting the sale of food, beverages and fodder, and all agricultural inputs which contain nanotechnology, until it is shown that they are safe and to approve an international system of regulation specifically designed to analyse these products.

The history of the Precautionary Principle, referred to here by the IUF, stretched back to the 70s and has been used in some international agreements and legislation. The Montreal Protocol (1987), dedicated to the substances that can reduce the Ozone Layer, refers to precautionary measures that must be taken. The Rio Declaration of 1992 also advises countries to take precautions to protect the environment. In 2000, the European Commission issued a communiqué on the Precautionary Principle. This principle consists, in general terms, of a measure of public policy to be applied when there are potential serious or irreversible risks to health or the environment, and before such risks become real dangers. This policy assumes, among other things, that there will be research and monitoring mechanisms so that dangers can be detected in advance (EEA, 2001). The Precautionary Principle assumes that measures to protect health and/or the environment will be taken before there is any solid scientific evidence that the risks do indeed exist; in other words, products subject to the Precautionary Principle must offer "reasonable scientifically grounded assurance that they pose no danger". In this way, the Precautionary Principle contains a scientific basis (there is no danger) and a political and general basis (reasonable assurance) (Groth III, 2000).

Although there already are some proofs, and all the public institutions for risk assessment recognize that nanoparticles have different toxicity, the scientific evidence concerning the risks of nanotechnology products is still rather thin on the ground. Owing to the lack of methods and the scarce scientific data, a preventive and cautious policy would be to put a stop to research (the workers, scientists and laboratory technicians could come to harm) and the commercialization of nanoparticles (consumers could come to harm) until scientific proof is given that show there are no risks or that if there are risks, they can be reverted. This latter statement reflects the IUF resolution, being against the tendency of businesses to launch nanoparticles on the market before sufficient research has been done to evaluate their potential dangers.

From the financial viewpoint, there are those who argue that regulation can only stand in the way of the development of nanotechnologies, and point to the information technology revolution as an example, as it thrived in an unregulated environment (Wolfe, 2005). But it is obvious that workers have no need to be concerned about the growth of business, but rather with the need for regulation.

The case of the United States shows that regulating new technology is no simple task. A document from the Woodrow Wilson International Center for Scholars (WWICS) analyzes a regulation guideline, the *Toxic Substance Control Act* of the United States and concludes that this does not take into consideration the difference in the behavior of substances between the macro level and the nanoscale. This is fundamental, since the properties of a chemical substance change depending on the scale. *The Toxic Substance Control Act* also fails to consider the possible new functions of nanoparticles. Therefore, to give an example, not always are the results of carbon nanotubes clear as they are used in dozens of different circumstances and carry out new functions (WWICS, 2002). In a more detailed document, the same institution analyzes all the legal instruments of the United States concerning the toxicity of nanoparticles. It concludes that, despite there being a number of laws which provide a basis for regulating nanotechnologies, all of them are flawed due to the hazy characteristics of the substances involved; therefore, it is doubtful that they can protect the public from potential risks (Davies, n/d).

Another difficulty that faces regulation is the shortage of funds for research into risks. It is estimated that of all the resources given to nanotechnology research, less than ten percent is set aside for researching possible health and environmental risks or their legal, ethical, social and economic implications.

When the IUF calls for international regulations, it is a few steps ahead of the proposals from industry and governments. While industry, business and the financial sector concentrate on research and regulations to lower the "negative risk perception",[2] they are leaving open the possibility that corporations will move their capital from country to country, seeking those nations where regulation is weakest. It may not be a coincidence, for example, that in Mexico, on the border with the USA, what is being called the largest industrial estate for nanotechnology in Latin America is being built (Foladori & Zayago, 2007). An international regulation, as proposed by the IUF, could put an end to these business labyrinths.

3. To demand that national and international patent offices, like the World Intellectual Property Organization (WIPO), decline to register all patent applications utilizing nanotechnology in the food industry and agriculture, until larger issues such as their social and environmental impact have been assessed with the participation of all stakeholders.

Patents are a form of intellectual property rights along with brand names, copyright and business secrets. Over the last few decades, knowledge as intangible capital, has been substituting physical capital as a source of profits. It is supposed that patents guarantee innovation by allowing their owner to set monopolistic prices on products that are patented for twenty years. However, patents also play a fundamental role on the financial markets as they, even without becoming a market product (only about 2% of patents end up being applied to a product) their potential can raise their prices and the value of the patent-holding companies, creating bubbles of economic growth that are not always based on the material economy.

The race for nanotechnology patents began in the mid nineties, when only 2000 or so nanotechnology patents had been registered worldwide. Since then, the growth in the registration of patents has been geometric, and ten years later there were 6000 registered patents (Regalado, 2004). Whoever controls the patents will control the new technology. Even when few of them will actually materialize into

[2] Lux Research informs that of the total number of products with nanocomponents that will be on the market by 2014, 25% will pose real risks during manufacture; 7% will pose real risks for the user of the products; and 14% will be exposed to perceived risks resulting from the expiration of products with nanocomponents; but it warns that 40% will be exposed to perceived risks (Lux Research, 2005).

marketable products, the fact is that patents are the battle horse of companies these days. Patents can be used as a barrier against entry into a certain area of business, they can do away with competitors, serve to obtain profits through their sale, increase the value of a company's shares and bring extraordinary profits when applied to market products.

Nevertheless, nanotechnology patents face many practical difficulties. The classification systems of patents are not adapted to the specific properties of nanotechnology, nor is there any specific classification for them in a way that is arguable if a great deal of inventions enters the nanotechnology field. The enabling characteristic of many nanoproducts, such as carbon nanotubes, which can serve many uses means that the same patent can be applied to many different products; as a result, the patent could reach a high market price. These difficulties have generated in the USA a legal dispute surrounding patents, legally contested patents, high legal fees and uncertainty on the part of judges.

The ETC Group published a document in which it argues that to patent the basic elements and the devices of nanotechnology could monopolize any possibility for research and development (ETC Group, 2005a). As many of the elements invented by nanotechnology can have many different uses, whoever acquires the patent for a carbon nanotube or a fullerine, could close the doors on research into the potential uses of the products. Another problem is the patents filed on the nano version of products that are traditionally used. One person in Chine has 900 patents on products related to the nanoscale version of traditional medicine. Furthermore, the ETC Group document points out that most patents are already concentrated in the United States, Japan, Germany, Canada and France, in the hands of large multinational corporations such as IBM, Micron Technologies, Advanced Micro Devices and Intel. Although small or developing countries may patent some inventions, it is clear that the new nanotechnology revolution will give an advantage to the corporations and countries that own most of the patents and can exercise their monopolistic power. The impacts could be devastating for many businesses and countries.

Nanotechnology in agrifood is a dynamic field for patents. In the agricultural sector, large corporations such as BASF, Bayer Crop Science, Syngenta and Monsanto are patenting nanoencapsulated pesticides that dissolve in water with greater durability, require a lower quantity of active product and are more lethal or only affect their target, without any announced side effects (ETC, 2004). The nano version of an old pesticide, in some cases, can lead to the creation of a new pesticide and as a result prolong the lifespan of the original patent. In the field of food and nutraceuticals, nanocapsules are also used and nanocochleates for the provision of food supplements and/or for changes to the flavor, texture and color of food. Many of these procedures have been patented. Aquanova patented a solution that combines a reduction of fats and satiety in one package (NovaSOL); Unilever has patents for nanoemulsifiers that are applied to food and cosmetics. Along with Nestlé, Unilever has patents for nanocapsules for food and food supplements. Kraft also has patents on nanocapsules and nanoparticles for food.

In agriculture, the revolution of nanotechnologies may be so devastating for peasants and small farmers as the introduction of mechanized farming. In the food industry, the substitution of the labor force, the obsolescence of many branches of industry and services and the rise of new branches with no union or organizational precedents is without doubt a worry for many workers. The demand of the IUF to halt granting international patents touches on the nerve center of the nanotechnology business since, otherwise, business would come before the needs of and risks to consumers and workers, as is already happening.

4. To demand that the World Health Organization (WHO) and the United Nations Food and Agriculture Organization (FAO) update the *Codex Alimentarius*, taking into account the use of nanotechnology in food and agriculture.

The *Codex Alimentarius* is a set of standards, practices and recommendation concerning the production of food and its handling, the purpose of which is to provide safety for the consumer. It was created in 1963, and in the Commission whose task is to keep it up to date are the Food and Agriculture Organization of the United Nations and the World Health Organization. As this code is recognized by the World Trade Organization as a reference point for the solution of conflicts, the call from the IUF on this point will also affect international transactions.

The application of nanotechnology to agriculture and food is increasing rapidly. Estimates of the Helmut Kaiser consultancy place the branch of nanofood among those which will most grow in the short term, its market going from seven billion dollars in 2006 to 20.4 billion dollars in 2010 (Kaiser, 2004).

The European Nanotechnology Gateway (Nanoforum.org) published its report *Nanotechnology in Agriculture and Food* in early 2006 (Joseph & Morrison, 2006). In it, these activities were updated on a worldwide scale, the same activities had already been set out and identified in greater detail in the ETC Group document (2004) entitled *Down on the Farm*. Nanotechnology deals with precision agriculture, in which many variables are monitored and in which inputs such as water, fertilizers, pesticides, herbicides, etc., are applied in the specific quantity and place where they are needed. The intelligent distribution of inputs in vegetables, utilizing systems that detect the health of each one of the crops allows to warn the farmer of imbalance even before he himself notices it and provides nanocapsules that avoid secondary effects and limit the amount to what is necessary. There are also other applications, such as the cultivation of gold nanoparticles through their capture by certain plants that absorb them from the soil that contains them, or the cleaning of soil and water courses. If these nanoparticles have secondary effects during their production, their use, or once the life cycle where they are inserted ends up, is something that science does not know for sure. This is the basis for the demands of the IUF.

Among the many possible applications of nanotechnology in the food industry, the revolution of packaging is possible the closest. Intelligent packages can warn the consumer when its content has expired or contaminated; they are capable of responding intelligently, adapting to changes in the environment or their own deterioration, fixing openings or tears; they are antimicrobial; and microchips can be incorporated into the product itself, not only the packaging, microchips which track the product until it has been consumed. All these are innovations which will replace jobs, instruments and machinery and redesign the social division of work (ETC, 2004).

Interactive food and nutraceuticals are other areas of great interest. Interactive food contains nanocapsules with colors and flavors which are only released when the consumer, or his organism, demands them. Nutraceuticals are foods which contain food supplements, medicaments or cosmetics, like the Australian bread TipTop that we mentioned at the beginning of the article. In 2002, Nestlé and L'Oreal, two well-known companies, the former in the food industry and the latter in cosmetics, announced that they were setting up a joint venture called INNEOV to produce nutritional cosmetics that improve the quality of the skin, nails and hair (Nestlé, 2002). Several techniques of nanotechnology enable these combinations, like the nanocapsulate which, along with nanosensors, would allow the "cosmetic" part of the food to remain inactive but liberate it should deficiencies be detected in the organism.

5. To request the WHO to initiate short and long-term studies into the potential effects of nanotechnology - especially nanoparticles - on the health of the technicians and workers that produce them, users and consumers.

For decades now there have been regulations for safety in the workplace and safety for the consumer. Why can the same criteria not be used for work with nanotechnologies and the consumption of products containing nanotechnology? Maynard, a specialist on safety and occupational health for the Institute for Occupational Safety and Health in the United States, explains that the conventional form in which eventual risks of materials, liquids, gases and vapors are analyzed is by their mass and composition. The problem with nanoparticles and nanodevices is that their small size means that they are far more reactive because they have a greater exposed surface area. In an article in the British magazine *Nature*, in November

2006, fourteen leading researchers in the field of toxicology called attention to the potential risks of nanoparticles, warning about the need to take into consideration these dimensions of nanoparticles:

> Recent studies that examine toxicity of nanomaterials produced in cultures of cells and animals have shown that the size, surface area, surface chemistry, solubility and possible the form, all play a role in determining the potential of the nanomaterials produced to cause damage (Maynard, et al, 2006, 267).

Therefore, nanotechnologies are a challenge to the traditional methods of evaluating occupational health and risk assessment and instruments to measure currently in use. Therefore, it is important that new technologies should be designed bearing in mind the criteria of size, shape, surface area, activity area and structure, and that new instruments should be made for detecting and monitoring.

The problem here is the little importance that is given to researching risk. For the fiscal year of 2006, the United States earmarked a mere 3.7% of its federal budget for the National Nanotechnology Initiative to conduct research into the health and safety of workers; and a further 4% for the ethical, legal and social implications of nanotechnologies (NanoWerk, 2006). If we add to this the fact that the sale of products with nanoparticles is growing geometrically and that, as a result, the number of workers involved in these processes that produce or utilize nanoparticles and nanodevices, we can see the urgent need for preventive measures.

More seriously still, is the fact that, although the budget for risk research is insignificant compared to the challenge posed by the increasing number of new and unknown elements, research has already been carried out in laboratories with animals which has proven that there are health risks. We know that some nanoparticles can penetrate the natural barriers of the organism like the blood barrier in the brain and placenta and penetrate the skin and enter the body, become lodged in the lungs and do harm to DNA, etc.

Friends of the Earth – Australia, published a document in 2006 on the risks that cosmetics that made use of nanocomponents possess (Miller, 2006), and, in

March 2007, another specifically concerned with the potential toxicity of silver used on the nanoscale, one of the most commonly used products as bactericides in refrigerators and washing machines and food packaging (Senjen, 2007). The silver solutions or the titanium or silicon dioxide bypass many regulations. In the United States, for instance, the Food and Drug Administration uses mass criteria to indicate the potential toxicity, but on the nanoscale this is not enough (Senjen, 2007, ETC, 2004).

6. To request the International Labour Organization (ILO) to carry out an urgent study into the possible impact of nanotechnology on conditions of work and employment in agriculture and in the food industry. Following completion of the study, a Tripartite Conference on the subject must be convened as soon as possible.

There is no doubt that a technological revolution that creates new materials and revitalizes old ones by joining them to new functions will have profound implications for the social division of labor. It is quite likely that some products and branches of production will be substituted by others, as has already happened in previous technological revolutions. In a document drafted for the South Center, the ETC Group (ETC Group, 2005b) analyzes the potential impacts of nanotechnologies on the markets, especially those that affect developing countries. Studying the case of the market for rubber, platinum and copper, the document shows that there are nanotechnological procedures which could improve the durability of the rims of automobiles, which is the main market for rubber, and this could significantly reduce the demand for this product worldwide. Furthermore, carbon nanotubes could become a serious competitor of copper cables, affecting the demand for this product on a worldwide basis. Platinum could be replaced by nanotechnology as a catalyst in converters and batteries. These are but a few examples of the pressure that some countries which export these raw materials could face when they begin to feel the effects of the substitution of their products for products of nanotechnology. The ETC Group estimates that textile fibers such as cotton and jute could be among the first for which nanotechnological substitutes will be found. As a result, thousands, maybe millions, of farmers and agricultural wage earners would be deeply affected, with many of them facing economic ruin and poverty.

Another important impact will stem from compacting several activities into just one, motivated by the new nanotechnology products; as is the case of intelligent packaging, which we referred to earlier on. The reduction in the number of functions leads to the convergence of several branches of production which are different today into only one. The fusion of the cosmetics and food industries is on the horizon. These changes, besides economic consequences will have profound political implications. Will the economic unification of cosmetics and food lead to the unification of the workers and their unions?

More qualified sectors will also suffer devastating impacts. One of the more dynamic branches of medical nanotechnology is that of diagnostics. Laboratories within chips attached to the body or traveling in it, as if they were a virus, will be able to analyze dozens of biomarkers in seconds and send their signals to external computer systems. Laboratory workers and nurses, and even a significant part of the work of a doctor will be made automatic, cheapening the cost of qualified workforce and making it obsolete in these fields.

Conclusions

Nanotechnologies are an ongoing technological revolution. Given the globalized nature of the economy, the impacts will hit the whole world at the same time. Owing to their highly disruptive nature, given that they bring new functions to materials and create new materials, it is likely that this revolution will occur much more rapidly than previous revolutions. Furthermore, due to their enabling essence, in that nanotechnologies can be applied to practically all branches of economic activity, it is possible that they will appear horizontally in different sectors of the economy.

The above would not be a problem if the course of events were dealt with in a planned and precautionary manner. Nevertheless, this growth is geometric in that it means new products with nanocomponents and nanodevices and their incorporation into the market, but when it comes to research and precautionary measures against risk, the dynamic is very slow and restricted. Furthermore, governments are doing very little about researching the potential impacts to their economies and how to make up for the unemployment of workers when their jobs become obsolete or the branches of industry that they work in disappear. There is also no much worry about people's qualifications and those of the workers when the time comes to meet the requirements that the new technological revolution will surely bring. The general conclusion that these tendencies show is clear: the pace of development of nanotechnologies, the fields in which it is being researched and produced, the countries and regions where it is gaining force and the financing for it are all under the command of large corporations that hold most of the patents and concentrate most of the research.

While for big capital this is a vast new frontier that is ripe for the picking of profits, for the civilian population and the workers there is a great deal of uncertainty and a lack of transparent information. The only thing that is clear is that if organized labor does not apply pressure for the course of this process to be addressed, they and the rest of the civilian population will bear the brunt of all the possible consequences, unforeseen results and scientific errors that may come. It is highly important that labor unions follow the path set by the IUF and press international organizations to take on the tasks of assessing the risks, planning activities to make up for the economic and social impacts and seek international regulation of the process of developing nanotechnologies.

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