Chapter 1 : Science, Religion, and Secularism Part V: Ian Barbourâ€”The Synthesis Model

Science of Synthesis. Full-text resource for methods in synthetic organic chemistry. Science of Synthesis provides a critical review of the synthetic methodology developed from the early s to-date for the entire field of organic and organometallic chemistry.

S There are different classifications of nanostructures in nanotechnology. Nanostructures usually classified by their geometrical properties. Nanostructures usually consist of nanocages, nanocrystallites, nanobelts, nanoneedles, nanocomposites, nanofabrics, nanofibers, nanoflakes, nanoflowers, nanofoams, nanomeshes, nano- particles, nanopillars, nanopin films, nanorings, nanorods, nanoshells, nanopow- ders, nanoclusters, nanowires, nanotubes, quantum dots, quantum heterostructures and sculptured thin films Classifying nanostructures according to their dimensions is the most popular mode of their classification. As shown in Figure 1. The zero-dimensional nanostructures are nanoparticles. The one-dimensional nanostructures are whiskers, fibers or fibrils , nanowires and nanorods. In many cases, nanocables and nanotubes are also considered one-dimensional structures. Thin films are considered as two-dimensional nanostructures. Colloids bearing complex shapes have three-dimensional nanostructures. As an interesting example of nanostructures, different nanostructures of carbon such as fullerenes, nanotubes, nanocones and graphene have exclusive mechanical and physical properties. Their superior properties are related to their firm skeletons created by bonded planar orbitals sandwiched between overlaid unsaturated bonds. Small atoms such as boron, nitrogen, and so on can diffuse among or replace the atoms of these nanostructures to increase their various properties or create locally active sites. Carbon nanostructures can also be chemically treated to achieve other activities, especially catalytic activities Some researchers also add amorphous materials as another branch for this classi- fication. All of the dimensions of 0-D nanostructures are in the nanometric size range such as nanoparticles or well-separated nanopowders. The 1-D nanostructures have a dimension that is outside the nanometric size range. These 1-D nanostructures have a shape like a rod, and consist of nanotubes, nanorods, nanoneedles, and nanowires. The 2-D nanostructures have two dimensions outside of the nanometric size range. Hence these 2-D nanostructures display plane-like structures, and consist of thin films, nanocoatings, and nanolayers. The 3-D nanostructures have three dimensions outside of the nanometric size range. These bulk 3-D nanostructures consist of many various kinds themselves, and usually comprise nanocrystalline units that show the affected properties of nanoscale due to the size effect. A 3-D nanostructure can include different distributions of nanoparticles or nanocrystallites, groups of nano- wires and nanotubes, and also different nanolayers. All of the 0-D, 1-D, 2-D and 3-D nanostructures can be amorphous or nanocrystalline. The simplest shape of a 2-D nanostructure is a plane with a depth below nm and other dimensions larger than nanometric dimensions. In spite of its external dimensions, this plane can show interior nanostructural dimensions, for example, nanocrystals or nanograins with nanoscale dimension. This 2-D nanocrystalline layer may exhibit some new size-related properties different from those of a microcrystalline layer. If the external thickness remains in the nanometric size range, the interior grains crystallites can be outside of the nanoscale and yet still categorized as a nanostructured material. So the interior structural dimensions for grains or crystal- lites and exterior surface dimensions exclusively its depth can be in the nanometric size range, and this difference will divide the 2-D nanostructures as internal nanostructured and non-internal nanostructured layers. The dimensions of 3-D nanostructures will not be located in any nanometric size range but they still show such size-affected properties. For example, 3-D nanocom- posites can be produced with two or more phases with different properties and their total synergistic properties cannot be reached by each phase alone. The matrix of the nanocomposite has dimensions bigger than nanometric scale and the reinforcing material is generally at the nanometric size range. These 3-D nanostructures can be classified by the type of reinforcing phases, for example, nanoparticles, nanorods, nanotubes or nanoflakes. Also the 3-D nanostructure can be nanocrystalline or microcrystalline in its internal structure, such as mentioned for 2-D nanostructures. Nanomaterials have the structural features in between of those of atoms and the bulk materials. While most microstructured materials have similar properties to the corresponding bulk materials, the properties of materials with nanometer dimensions are significantly different from those of atoms and bulks materials. This is mainly due to the nanometer size of the materials which render them: Especially when the sizes of nanomaterials are comparable to length, the entire material will be affec ted by the surface properties of nanomaterials. This in turn may enhance or modify the properties of the bulk materials. Optical properties One of the most fasc inating and useful aspects of nanomaterials is their optical properties. Applications based on optical properties of nanomaterials include optical detector, laser, sensor, imaging, phosphor, display, solar cell, photocatalysis, photoelectrochemistry and biomedicine. The optical properties of nanomaterials depend on parameters such as feature size, shape, surface characteristics, and other variables including doping and interaction with the surrounding environment or other nanostructures. Likewise, shape can have dramatic influence on optical properties of metal nanostructures. With the CdSe semiconductor nanoparticles, a simple change in size alters the optical properties of the nanoparticles. When metal nanoparticles are enlarged, their optical properties change only slightly as observed for the different samples of gold nanospheres in fig. However, when an anisotropy is added to the nanoparticle, such as growth of nanorods, the optical properties of the nanoparticles change dramatically. Magnetic properties Bulk gold and Pt are non-magnetic, but at the nano size they are magnetic. Surface atoms are not only different to bulk atoms, but they can also be modified by interaction with other chemical species, that is, by capping the nanoparticles. This phenomenon opens the possibility to modify the physical properties of the nanoparticles by capping them with appropriate molecules. Actually, it should be possible that non-ferromagnetic bulk materials exhibit ferromagnetic-like behavior when prepared in nano range. One can obtain magnetic nanoparticles of Pd, Pt and the surprising case of Au that is diamagnetic in bulk from non-magnetic bulk materials. In the case of Pt and Pd, the ferromagnetism arises from the structural changes associated with size effects. However, gold nanoparticles become ferromagnetic when they are capped with appropriate molecules: Surface and the core of Au nanoparticles with 2 nm in diameter show ferromagnetic and paramagnetic character, respectively. The large spin-orbit coupling of these noble metals can yield to a large anisotropy and therefore exhibit high ordering temperatures. More surprisingly, permanent magnetism was observed up to room temperature for thiol-capped Au nanoparticles. For nanoparticles with sizes below 2 nm the localized carriers are in the 5d band. Bulk Au has an extremely low density of states and becomes diamagnetic, as is also the case for bare Au nanoparticles. This observation suggested that modification of the d band structure by chemical bonding can induce ferromagnetic like character in metallic clusters. Thermal properties of NSM The thermal properties of nanomaterials have only shown a slower progress. This is partially due to the difficulties of experimental measuring and controlling the thermal transport in nano scale dimensions. Atomic force microscope AFM has been introduced to measure the thermal transport of nanostructures with nanometer-scale high spatial resolution, providing a promising way to probe the thermal properties. In non-metallic material system, the thermal energy is mainly carried by phonons, which have a wide variation in frequency and the mean free paths mfp. The heat carrying photons often have large wave vectors and mfp in the order of nanometer range at room temperature, so that the dimensions of the nanostructures are comparable to the mfp and wavelengths of photons. However the general definition of temperature is based on the average energy of a material system in equilibrium. For macroscopic systems, the dimension is large enough to define a local temperature in each region within the materials and this local temperature will vary from region to region, so that one can study the thermal transport properties of the materials based on certain temperature distributions in the material. But for nc systems, the dimensions may be too small to define a local temperature. Moreover, it is also problematic to use the concept of temperature which is defined in equilibrium conditions for the non-equilibrium processes of thermal transport in nanomaterials posing difficulties for theoretical analysis of thermal transport in nano scales. In spite of all the difficulties in both experimental and theoretical characterization the thermal properties of nanomaterials, recent advances in experiments have shown that certain nanomaterials have extraordinarily thermal properties compared to their macro- scopic counterparts. For example, silicon nanowires have a much smaller thermal conductivities compared to bulk silicon. Because of tubular structures of carbon nanotubes, they have extreme high thermal conductivity in axial directions and high anisotropy in the heat transport over the specimen. Interfaces are also very important factor for determine the thermal properties of nanomaterials. Generally, the internal interfaces impede the flow of heat due to photon and phonon scattering. At interface or grain boundary between similar materials, the interface disorder scatters phonons, while as the differences in elastic properties and densities of vibration states affect the transfer of vibration energy across interfaces between dissimilar materials. As a result, the nc structures with high interfaces densities reduce the thermal conductivity of the materials. These interconnected factors joined together to determine the special thermal properties of the nanomaterials. Chemical Properties of NSM One of the important factors for the chemical applications of nanomaterials is the increment of their surface area which increases the chemical activity of the material. Due to their enhanced chemical activity, nanostructural materials can be used as catalysts to react with such noxious and toxic gases as carbon monoxide and nitrogen oxide in automobile catalytic converters and power generation equipment to prevent environmental pollution arising from burning gasoline and coal. Bulk gold is chemically inert and thus considered to be not active or useful as a catalyst. However, gold nanoparticles can have excellent catalytic properties. For example, gold nanoparticles with clean surface have demonstrated to be extremely active in the oxidation of carbon monoxide if deposited on partly reactive oxides, such as Fe, NiO and MnO, alumina and titania and are also found to be reactive. Au nanoparticles also exhibit extraordinary high activity for partial oxidation of hydrocarbons, hydrogenation of unsaturated hydrocarbons and reduction of nitrogen oxides. Fuel cell technology is another important application of the noble metal nanoparticles relating the catalysis of the reactions. In the present, the fuel cell catalysts are based on platinum group metals PGM. Pt and Pt-Ru alloys are some of the most frequently used catalysts from this group. In fact, the use of these metals is one major factor for cell costs, which has been one of the major drawbacks preventing it from growing into a more important technology. One possibility to produce economical catalysts is the use of bimetallic nanoparticles. Bottom-up and top-down methods of synthesis Nanomaterial - synthesis and processing Nanomaterials deal with very fine structures: This domain is a pure example of interdisciplinary work encompassing physics, chemistry, and engineering upto medicine. There are two approaches to the synthesis of nanomaterials: In the bottom-up approach, molecular components arrange themselves into more complex assemblies atom-by-atom, molecule-by-molecule, cluster-by- cluster from the bottom e. In top-down approach, nanoscale devices are created by using larger, externally- controlled devices to direct their assembly. The top-down approach often uses the traditional workshop or microfabrication methods in which externally-controlled tools are used to cut, mill and shape materials into the desired shape and order. Attrition and milling for making nanoparticles are typical top-down processes. In the Bottom-up approaches, in contrast, arrange molecular components themselves into some useful conformation using the concept of molecular self-assembly. Synthesis of nanoparticles by colloid dispersions is an example of the bottom-up approach. Lithography is an example in which the growth of thin film is a bottom-up method whereas itching is a top-down method. This approach plays a very important role in preparing nanomaterials having very small size where the top-down process cannot deal with the very tiny objects. The main driving force behind the bottom-up approach is the reduction in Gibbs free energy. Therefore, the materials produced are close to their equilibrium state. For example, nanowires made by lithography are not smooth and can contain a lot of impurities and structural defects on its surface.

Chapter 2 : Synthesis - Wikipedia

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Science, Religion, and Secularism Part V: Ian Barbourâ€"The Synthesis Model October 5, by Daniel Halverson 2 Comments In previous articles, we explored the conflict , independence , and dialogue models in science and religion studies. In the synthesis model, the goal is to arrive at a unified world picture that incorporates the most important insights from both science and theology. Barbour identifies three principle representatives of the synthesis model: Natural theology is the enterprise of reasoning about God on the basis of scientific evidence. A person who thinks that the facts of the natural world, as revealed by science, authorize claims about what God must be like, is doing natural theology. For instance, a person who argues that the origin of temporal reality, in the Big Bang, implies a transcendent reality, prior to and independent of that origin, is involved in natural theology. They are saying that the facts of science tell us something important about God. Cosmologists have discovered that if the fundamental constants of physicsâ€"things like the strong and weak nuclear forces, gravity and electromagnetism, etc. It is difficult to overstate how slight a fluctuation in the values of these constants would be required to generate a radically different universe. Some scientists, such as physicist Freeman Dyson, and biologist Michael Denton, have concluded that the universe must have been set up with us in mind from the beginning. In a future article, I hope to explore these arguments and the counterarguments offered by their critics more thoroughly. While it is familiar that theists often engage in natural theology, it is somewhat less familiar that atheists and agnostics often do as well. In order to flesh out this point, it may be useful to consider another book written by Gould. It is, after all, not necessary, but only probable, that the organism that is best adapted to its environment will propagate its kind. Suppose, for instance, that there are twenty roaches in a kitchen, and one of them has been endowed with superior intelligence through the process of random mutation. That roach will be better adapted and more likely to propagate its kind, all things being equal, but it is no necessary truth of nature that it will, in fact, propagate its kind. If that roach hatches on a Tuesday, and the exterminator arrives on a Wednesday, then, superior intelligence notwithstanding, it is just as likely to be poisoned as all the rest and thus fail to propagate its kind. Evolution is made up of an unfathomable number of contingent events just like this, where the qualities of the individual organism are not necessarily decisive. According to Stephen Jay Gould, since any of these events could have been different, the outcome of the evolutionary process could have been as well. They would be elegant, precise, and orderly, like a cathedral or a math equation, rather than the haphazard affairs we actually find in nature. A similar example is furnished by the biologist JBS Haldane, who was once asked what he thought nature revealed about God. The comment was meant sarcastically, but an advocate of the synthesis model might just as well take it seriously. They might suggest that perhaps God is less like an architect, or a king, or a mathematician, as represented in earlier theologies, and more like an artist or a poet, who delights in change and variety for their own sake. Rather than jettisoning theology just as such, they might simply modify some of its premises in light of new evidence. The appearance of randomness and haphazardness in nature is genuine, but this does not mean that God is not in control of the overall system. A second approach identified by Ian Barbour is theology of nature. Where natural theology tries to understand God in scientific context, theology of nature tries to understand nature in theological context. One example of a theology of nature is provided by biochemist and theologian Arthur Peacocke. Peacocke understands the doctrine of providenceâ€"the view that God is not only the creator, but the controller, of the natural worldâ€"in light of Darwinian evolution. If evolution is an open-ended, rather than a fixed, process, as Stephen Jay Gould has argued, then the doctrine of providence requires reformulation. In what sense is God still the controller of the natural world? Peacocke has suggested that it is in a statistical sense. A person at a casino may not be in control of the outcome of a game of blackjack, or roulette, or slots, but they do choose to play one game rather than another. In the same way, according to Peacocke, God knows what sort of potentialities are inherent in nature without knowing where it will end up. It is the difference between designing a game, and playing it. The person who designs the game has good information about what sort of outcomes are likely, or possible, but does not know what the result of any particular instance of that game will be. On the opposite side, philosopher Alvin Plantinga has argued in his book Where the Conflict Really Lies , that the appearance of randomness in nature is not genuine, but a metaphysical add-on. In the strictly biological sense, randomness means that a mutation has no preset, adaptive purpose. It could be good for the organism and help it thrive, it could be bad and hinder it, or it might not make much of a difference. More often than not, mutations are maladaptive. In order for Darwinian biology to effectively explain speciation, random mutation only needs to be adaptive in a very few instances. Most organisms live and perish without greatly affecting the evolutionary trajectory of the breeding population to which they belong very much, one way or another. Only a few exceptional organisms acquire, through random mutation, an advantage that will be favored by natural selection. It is in this sense that adaptations are random. It is difficult to see how this conclusion can be established according to normal methods of scientific inquiry. It is really a metaphysical add-on, and no part of Darwinian biology just as such, according to Alvin Plantinga. God may, indeed, be fully in control of the entire evolutionary processâ€”as deterministic and preset as you likeâ€”and have had particular outcomes in view right from the beginning, without modifying the empirical, non-metaphysical content of Darwinian biology one way or another. They are both doing theology of nature. For Peacocke, the result is that structured randomness does not contradict, but just is, the meaning of providence. For Plantinga, the result is that randomness is real in the biological sense required for Darwinian biology, but not in the metaphysical sense required to disprove the doctrine of providence, as it has historically been understood. A third option for synthesis is called process theology, which will be the subject of a future article but a very brief discussion will be given here. Ian Barbour himself was an advocate of process theology, which proposes a radically new conception of God in light of modern science. Process theologians argue that orthodox theology has been unduly influenced by Greek ideas, especially those of Plato, whose notion of being or reality as stasis cannot be maintained in light of what we now know about the natural world. The world is not a being, according to process theologians, but a becoming. It is in a continual process of change. If we understand God in light of science, as the synthesis model urges, then we will understand God as a becoming rather than a being, as well. The permanent, necessary, and rational nature of mathematics, as understood through Platonism, has deeply informed Christian theology. Change is denied, permanence affirmed. Seven does not become a prime number, and will never not be a prime number, and is not a prime number as a result of any contingent fact of the world. It simply is a prime number, always and necessarily. According to process theologians, the appropriate model for theology is not mathematics, but biology. Just as the world of life is continually creating itself, so too is God. What God was a million years ago is not what God is today, and not what God will eventually become either. A synthesis model has some attractions for intellectuals who want to do justice to both theology and to science, but it is also open to criticism. To offer just one, scientific theories change very rapidly. A century ago, science definitely discovered the truth, the universe had always existed, and Darwinian biology was struggling for credibility against a resurgent Lamarckism. Today, science gives us access to useful paradigms that may or may not be true, and to technologies that may or may not be a benefit, the universe exploded into being approximately 14 billion years ago, and a firm line has been drawn underneath Darwinian biology. Science moves on a very rapid timescale, when compared to the great theological traditions of the world, which frequently trace their origins back to the Bronze Ageâ€”or, indeed, when considered on their own terms, right back to the beginning of the universe! A big part of the attraction of religious involvement just is its promise to relate people to transcendent and eternal truths. It is by no means clear that this promise is made more credible by rewriting foundational doctrines every time the paradigm shifts. Daniel Halverson is a graduate student studying the History of Science and Technology. He is also a regular contributor to the PEL Facebook page.

Chapter 3 : Synthesis | Definition of Synthesis by Merriam-Webster

gulf watch alaska sampling extends from intertidal organisms to those inhabiting offshore, oceanic domains. the role of science synthesis is to determine connections between these different ecosystems and assess how they respond to environmental variability.

Thank you for your input. What is the role of hemoglobin in the body? How is hemoglobin produced? Why might hemoglobin concentrations in the body increase? Why might hemoglobin concentrations in the body decrease? How do you keep Daphnia alive? What is the role of hemoglobin in Daphnia? How might decreased dissolved oxygen levels affect hemoglobin production in Daphnia? How might decreased atmospheric oxygen levels affect hemoglobin production in humans? Daphnia magna are small crustaceans that live in freshwater ponds and streams. They are sensitive to poor water conditions and are sometimes used to determine water quality. Hemoglobin is a protein in the blood that carries oxygen from the lungs or gills to the cells of many organisms. In this experiment, the student will manipulate the oxygen concentrations of the water in which the Daphnia are kept, to evaluate the hemoglobin production of the creatures. Daphnia magna Culture Kit available at http: Observe your Daphnia population. Use a magnifying glass or microscope to help you see small details of their bodies. Take pictures of your initial culture and make a sketch of an individual Daphnia. You can use a bit of petroleum jelly to hold an individual Daphnia for observation. Be sure to color the sketch accurately with colored pencils. What do you think will happen to the Daphnia as the oxygen concentration of their environment is decreased and why? Feed your Daphnia to prepare them for the low oxygen experiment. Carefully cover the surface of the water in the aquarium with plastic wrap. This will prevent gases from entering or leaving the surface of the water. As the Daphnia use up the oxygen and produce carbon dioxide, dissolved oxygen concentrations in the water will drop. Observe your Daphnia over the next weeks. Each day, take a picture of the population. Especially pay attention to the color of the Daphnia. Since they are transparent, the color change you observe should be a direct result of the change in their blood and hemoglobin synthesis. After weeks, remove the plastic wrap. Take pictures of the population and make another sketch of an individual Daphnia. Color the sketch accurately to show any changes that have taken place. Feed your culture and allow them to return to normal without the plastic wrap. Observe them daily and take pictures. After week or so, if they are back to normal, sketch another individual. Conclude your experiment by assessing your hypothesis. Did the Daphnia change in the way you predicted? Show your daily observation results with a bar or line graph.

Chapter 4 : Hemoglobin Synthesis | Science project | calendrierdelascience.com

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Chapter 5 : Science Analytics and Synthesis (SAS)

Science and synthesis: an international colloquium organized by Unesco on the tenth anniversary of the death of Albert Einstein and Teilhard de Chardin Unesco Springer-Verlag, - Biography & Autobiography - pages.

Chapter 6 : Synthesis | Define Synthesis at calendrierdelascience.com

Building on the knowledge, strategies, and methods accumulated through these efforts, here we report the bottom-up synthesis and isolation of carbon nanobelt 1 ().This compound represents a belt segment of (6,6)CNT and is an isomer of [12]cyclophenacene.

Chapter 7 : Science of Synthesis Reference Library - Thieme Chemistry - Georg Thieme Verlag

Synthesis of nanoparticles by colloid dispersions is an example of the bottom-up approach. An approach where both these techniques are employed is known as a hybrid approach. Lithography is an example in which the growth of thin film is a bottom-up method whereas itching is a top-down method.

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Chapter 9 : Difference Between Analysis and Synthesis | Difference Between

The synthesis adopted a holistic perspective by focusing on issues that cross scientific disciplines and considering the integrated nature of terrestrial and aquatic systems and the interconnections between restoration of ecological processes and the social and economic concerns of communities.